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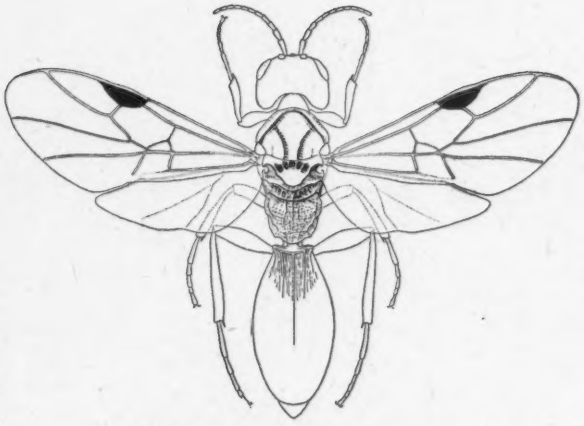

Vanhornia eucnemidarum Crawford.

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Offerata, rare species of North American Coleoptera. *Lack full set.

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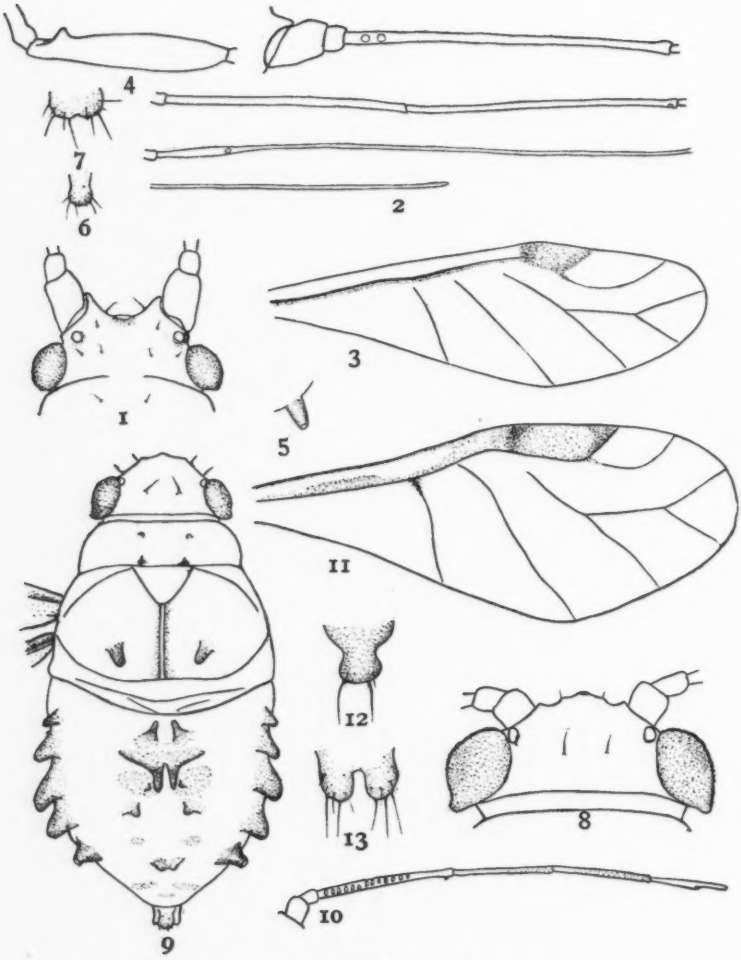

DAVIS ON APHIDIDAE.

ENTOMOLOGICAL NEWS

AND

PROCEEDINGS OF THE ENTOMOLOGICAL SECTION

ACADEMY OF NATURAL SCIENCES, PHILADELPHIA.

VOL. XXI. MAY, 1910. No. 5.

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Two Curious Species of Aphididae from Illinois.

BY JOHN J. DAVIS,

Office of the State Entomologist, Urbana, Illinois.

(Plate VIII)

The Inconspicuous Maple Aphid (**Drepanaphis ? minutus** n. sp.).

This interesting little species was found rather common on the under surfaces of the leaves of hard maple (*Acer saccharum*) in a natural forest two and a half miles west of Glencoe, Illinois. The individuals appeared as dark specks on the leaves, this because of the conspicuous dark head and thorax on the pale greenish background, the abdomen being pale and rather inconspicuous. They are capable of jumping, are quite active when disturbed, and live sporadically. All of the adults found were winged.

This fall (1909) I had the opportunity, through the courtesy of Mr. J. T. Monell, of examining some aphids collected by him on a small maple (*Acer nigra* ?) near Mine Lamotte, Missouri, August 13, 1890. They proved to be identical with the species here described. Mr. Monell has kindly permitted me to use his notes which I give in full at the end of the description.

Inasmuch as my specimens were collected in a natural forest some distance from artificial plantings, and further that the Monell specimens were also collected in a natural timber, the indications are that it is a native of the United States.

This species is especially interesting because it is closely related to *Drepanaphis* Del Guercio* and *Callipterus* Koch, and is apparently the connecting link between the two genera. The size and general appearance of the insect places it in the genus *Callipetrus,* while the antennal tubercles, antennae and legs are those of *Drepanaphis.* The style and wings and its habits are characteristic of both genera, while the cornicles are intermediate.

Winged vipiparous female—Head (Pl. VIII, fig. 1), and the thorax brownish (nearly black in old individuals), abdomen pale yellowish with a slight greenish tint. Eyes red. Ocelli conspicuous. Antennæ with the two basal segments concolorous with the head, and the remaining segments whitish; set on rather conspicuous tubercles; very long and thread-like, being fully three times the length of the body; segment I stout and robust, more than twice as long and one-half broader than II; filament VI is extremely long and thread-like, and easily broken, about two and one-half times as long as III and nearly fourteen times the length of base VI; III nearly one-half longer than IV; IV and V subequal, V being invariably slightly the longer; two (occasionally one or three) comparatively large circular sensoria near the base of III, the usual one at apex of V and several at apex of base VI; the transition between base and filament of VI gradual. (Pl. VIII, fig. 2). Beak not reaching the coxae of the second pair of legs. Wings callipterous-like, hyaline, and with pale brown veins; the first and second discoidal branching at a distance varying from one-third to nearly one-half (more often the former) the distance from where the third branches to the tip of the wing; stigmal vein curved at the base, then runs straight to the margin of the wing. (Pl. VIII, fig. 3). Legs frail and entirely whit-

*_Drepanaphis_ n. g. was described by Dr. G. Del Guercio in the "Revista di Patologia Vegetale," Anno IV, no. 4, August, 1909, from specimens of the so-called *Drephanosiphum acerifolii* Thos., sent him by the writer. *Phymatosiphum* n. g. was proposed by the writer for the same genus in the Annals of the Entomological Society of America, September, 1909, not knowing of Del Guercio's description the month previous.

ish; the fore femur bears a prominent projection or tubercle near the distal end. (Pl. VIII, fig. 4). Abdomen with no dorsal tubercles. Cornicles concolorous with the abdomen, small, broadest at the base and gradually narrowing towards the apex, the opening comparatively small and the tip more or less rounded; the length about twice the breadth. (Pl. VIII, fig. 5). This form of cornicles, unknown to me in any other aphid, is a gradation between those of *Drepanaphis* and *Callipterus*. Style callipterus-like, it being knobbed but only slightly constricted near the base. (Pl. VIII, fig. 6). The anal plate is bifid. (Pl. VIII, fig. 7).

Measurements (from specimens mounted in balsam)—Length of body, 0.98-1.236, av., 1.1124 mm.; 0.3272-0.436, av., 0.378 mm.; length of wing, 1.78-1.999, av., 1.898 mm.; width, 0.6545-0.7272, av., 0.6908 mm.; antenna I, 0.0815; II, 0.0326; III, 0.6094-0.7072, av., 0.6452; IV, 0.3912-0.5053, av., 0.4433; V, 0.4238-0.5605, av., 0.489; VI, base, 0.0978-0.1304, av., 0.1157; VI, filament, 1.4544-1.78, av., 1.5922; average, total, 3.3995 mm.; style, av., 0.065 mm.; cornicles, av., 0.048 mm.; hind tarsus, av., 0.927 mm.

Described from 24 individuals collected at Glencoe, Ill., September 2, 1909, mounted in balsam on 8 slides. Types preserved in the Illinois State Laboratory of Natural History as Acc. No. 43,267; in the U. S. National Museum, and in the writer's collection.

Habitat.—Glencoe, Ill., and Mine Lamotte, Mo.

Pupa entirely pale yellowish or greenish yellow, and bearing capitate hairs.

The following notes were made by Mr. Monell:

"189°—424x. *Callipterus* on maple. On small maple (*A. nigra* ?) growing on Mine creek, about 500 yards from the furnaces of Mine la Motte, Mo., August 12, 1890. Abundant living sporadic, Callipterus fashion. Head and thorax brownish or fuscous. Abdomen pale yellowish or usual Callipterus color. One winged had head and thorax like abdomen, but this one probably just acquired wings. Apterous is entirely pale greenish yellow.

"Examined slide 424x on October 26, 1908. The wings are now hyaline, not shaded, and the stigmal vein is still plainly seen its entire length. No tubercles on dorsum. Pupa with funnel-mouthed hairs on dorsum. Antennae of winged are

now very hyaline, and hard to measure, the transition between 6 and 7 very gradual. Antennal measurements as follows:

III	IV	V	VI	VII	Nectaries
0.585	0.442	0.471	0.142	0.928	0.042 mm.
0.585	0.414	0.428	0.142	1.285	mm.
				1.170	mm.

"Glycerine jelly mounts, with edges hardened with bichromate."

The Tuberculate Hickory Plant-Louse (**Callipterus caryaefoliae** n. sp.).

This characteristic aphid was found rather common on the upper surfaces, and occasionally on the under surfaces, of the leaves of hickory at Lake Forest, Illinois, June 24, 1909. It is sporadic, is very active and easily disturbed, moves about quite rapidly, and has a remarkable ability for leaping. Only winged adults were found.

The writer recently had the privilege of examining specimens of a hickory plant-louse in the collections of Mr. Monell, which proved to be the species here described. These specimens were collected by Mr. Monell on hickory at Mine Lamotte, Missouri, 18 years ago. He has kindly offered the use of his notes which I give in full at the end of the description.

It is with some doubt that I place this species in the genus *Callipterus*, which, except for the comparative length of antennal segment VI filament, might belong to Mordvilko's genus *Tuberculatus*. In Dr. Mordvilko's table* this species runs down to *Callipterus*.

Winged viviparous female—Entire body, including head, velvety black or dark brownish, usually the former. Immediately after mounting in balsam the body appears brownish or light brown, and the tubercles show up as black markings. On the thorax are two small white pulverulent spots. Also on the abdomen near the anterior part are two similar white spots, and at the posterior end is a mass of white pulverulence. In addition, there were several inconspicuous dots on the abdomen. The head bears two inconspicuous tubercles on the dorsum, one on each side of the median. (Pl. VIII, fig. 8). On the prothoracic segment are two pairs of dorsal tubercles, the anterior pair being similar to that on the head and the posterior pair larger. On

*Tables for the determination of groups and genera of Aphididæ. Ann. Rep. Zool. Museum, Imperial Acad of Learning, St. Petersburg, Vol. XIII, 1908.

each side of the abdomen anterior to the cornicles are four large, conspicuous lobes, or tubercles, which project laterally from the sides. The anterior one is smaller, and ofttimes concealed. They appear as fleshy lobes or flabellæ. Along each side of the dorsal median of the abdomen is a longitudinal row of tubercles, which tubercles are quite irregular in shape and size. The first pair, anteriorly, are conspicuous and separate; the second pair are finger-like projections, larger than the preceding pair, and joined at the base; the third pair smaller than either of the two preceding pairs, and more widely separated; fourth pair smaller, and more widely separated than the third; fifth pair, which are on the segment bearing the cornicles, are represented by almost imperceptible elevations. (Pl. VIII, fig. 9). Antennæ: Segments I and II black, the remaining segments pale brownish, excepting the distal ends of IV and V and all of VI, which are blackish; 11-19, usually 13, transverse sensoria in a row on the basal three-fourths of Segment III, and the usual ones at the tips of V and base VI; nearly or just reaching the base of the cornicles; Segment III the longest, it being one-half longer than IV, IV and V subequal, but IV invariably slightly the longer, VI about one-half the length of III, the basal portion about two-fifths longer than the filament. (Pl. VIII, fig. 10). Eyes dark red. Ocelli prominent in specimens mounted in balsam. Legs blackish excepting the middle portion of the tibiæ; the posterior femora greatly developed for jumping; the two hind femora with numerous small circular paler areas (differing from sensoria in that they are internal rather than external). Wings hyaline, veins, brownish, typical of the genus *Callipterus*, the first and second discoidals branching at about one-half the distance from where the third branches to the tip of the wing. (Pl. VIII, fig. 11). Cornicles black and tuberculate. Style of the globular type but slightly flattened as shown in the figure. (Pl. VIII, figs. 12 and 13).

Measurements (from speicmens mounted in balsam)—Length of body, 1.49 mm.; width, 0.78 mm.; length of wing, 2.07 mm.; width, 0.86 mm.; antenna I, 0.05; II, 0.049; III, 0.3912-0.4890, av., 0.4290; IV, 0.2526-0.3260, av., 0.2835; V, 0.2282-0.2934, av., 0.2542; VI, base, 0.1141-0.1385, av., 0.1287; VI, filament, 0.0733-0.1059, av., 0.0929; average total, 1.2873 mm.; cornicles, av., 0.066 mm.; style, av., 0.09 mm.; hind tarsus, av., 0.114 mm.

Described from 9 specimens collected at Lake Forest, Ill., June 24, 1909, mounted in balsam on five slides. Types in the U. S. National Museum, in the State Laboratory of Natural History as Acc. No. 43,266, and in the writer's collection.

Type locality, northern Illinois.

Monell's notes on this species are as follows:

"195°—437x. Mainly on the upper sides of leaves, but also on the lower sides. Very abundant on many hickory trees, on hill back of the furnaces, Mine Lamotte, Mo., May 27, 1891. Exceeding quick and active, sporadic, fully as active as the maple *Drephanosiphum*. (Under 20-dia. objective of the dissecting microscope by daylight.) Winged viviparous female (3 specimens examined): Head and thorax dark brownish. Eyes distinctly red. General fundamental color of abdomen yellowish. Markings on abdomen as in sketch, text, Fig. 1, the enclosures representing dark brown, and the crosses white pulverulent spots. There are other lesser markings. Row of tubercles near margin of abdomen, also dark brown. The front two closely adjacent white spots are on base of thorax and these, together with the inverted "T" white mark, patent to the naked eye. Apterous viviparous female (1 specimen examined): Yellowish to greenish yellow, with four rows of longitudinal dots foreshadowing markings of the winged female. Pupa (1 specimen) same as apterous female, but wing-covers greenish.

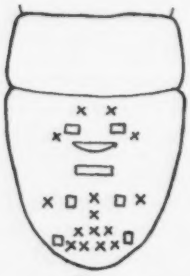

Fig. 1.

"195°, May 30, 1891.—Resumé. To naked eyes, whole in-

"195°, May 30, 1891.—Resumé. To naked eyes, whole in-sect appears dusky with two small white spots at base of thorax and an inverted T-shaped white mark on abdomen under the lens. Head and thorax dark brownish. The abdomen has, for the fundamental color, brownish yellow to light brown, with the nectaries and the series of tubercles black or dark brown. The insect has a number of pulverulent spots, the principal of which are noted above. On some winged, but not all, even saw some trifling pulverulence on neck at base of head.

"Immature mites, a species of *Erythraeus*, were found on the aphid."

EXPLANATION OF PLATE VIII.

Drepanaphis? minutus n. sp.: Figure 1, head; 2, antenna; 3, fore wing; 4, fore femur; 5, cornicle; 6, style; 7, anal plate; *Callipterus caryaefoliae* n. sp. 8, head; 9, body showing position of tubercles and dusky markings; 10, antenna; 11, wing; 12, style; 13, anal plate. Camera lucida drawings, figures 1, 2, 4, 5, 6, 7, 8, 12, 13, with one-inch eye piece and two-third obj.; 3 and 11 with one-inch eye piece and one and one-half-inch obj., giving a magnification a little less than one-half the two-third obj.; 9 and 10 with two-inch eye piece and two-third obj., giving a magnification slightly more than the two-third obj., with one-inch eye piece.

Carabidae from Harrisburg and vicinity, with notes.

By A. B. Champlain and H. B. Kirk, Harrisburg, Pa.

During the past two years, 1908 and 1909, we turned our attention to collecting insects, especially Coleoptera. The regions about Harrisburg are ideal for Carabidae and very rich in species of that family. We made an especial effort to turn up as many as possible and in this way brought together not only an interesting collection of specimens but notes and data that may be of interest to others. The collecting of Carabidae, although requiring more effort and actual labor than do most insects, is nevertheless just as interesting. During a day's collecting we would turn over a few tons of stones and it was seldom that we did not find some rare or interesting species. We found a great number of species in the early part of the year when the hibernating and emerging forms were most plentiful under stones, logs, the debris of the last year's vegetation, etc. One of the most interesting means of collecting was at night with our acetylene light. It would be a revelation to those who have not tried this plan to see the great numbers that can be taken in this way, especially on mud flats, banks or shores of streams; there you will find them feeding, running about. For this reason it should be understood that the turning over of stones and logs at night was not resorted to. A number of species were taken on the trunks of various trees and running along the paths in most any situation at night. We also found the electric lights or arcs worth our while.

The numerous islands in the Susquehanna River in this vicinity were also visited. The island on which we did most of our collecting is usually submerged during the winter months and other high water periods.

The majority of the determinations were made by Mr. Charles Liebeck, of Philadelphia, Pa., to whom we express our thanks for this and many suggestions that have been of help to us. Other members of the little band of local collectors and entomologists have turned up species that we have been unable to find; their names will be given in each instance, but in all

cases where the collector's name is not given, the records can be accredited to the authors.

There were 199 species and three varieties (the latter belonging to the genus Harpalus) collected within a radius of ten miles of Harrisburg. The localities are as follows:

Camphill .....C.	Linglestown .....L.
Enola .....E.	Middletown .....M
Eberlys Mill .....E.M.	New Cumberland .....N.C.
Harrisburg .....H.	New Market, York Co. ....N.M.
Rockville or Fort Hunter .....R.	

OMOPHRON Latr.

O. americanum Dej.—H., IV, 15, dug from the bank of the Susquehanna river, IV, 18, on sandy and muddy shores at night, X, 1, under stones. Common.

O. tessellatum Web.—H., V, 15 to 24, on sandy shores of island at night; rare.

CYCHRUS Fabr.

C. stenostomus Web.—From all localities, II, III, IV, and again IX, X, XI. Mostly under stones singly or in pairs, XI, 27 taken from a dead log in swamp; observed mating XI, 6. These localities abound with snails upon which we observed this species feeding and which probably accounts for its being so plentiful.

C. viduus Dej.—R., III, 20 (Coll. by E. Craighead). E., III, 31 in cell under stone, also in the mountains, VII, 3 under log.

CARABUS Linn.

C. sylvosus Say.—R., IX, 18 to X, 10 under stones; local and rare.

C. serratus Say.—R., E., H., II, III, under stones; IV, 11, 18 running along path at night; IX, 18 under stones; not uncommon.

C. limbatus Say.—R., E., throughout the year under stones; common.

C. vinctus Web.—IX, 21 dug from cells in dead logs and under stones in swampy places; common.

CALOSOMA Web.

C. Scrutator Lec.—R., III, 21 from cell under stone; H., VII, 6 to 30 at arc lights; common.

C. willcoxi Lec.—H., V, 16 to 18 (Coll. by Chas. Anderson) at arc lights; not common.

C. calidum Fab.—H., IV under log; V and VI on tree trunks at night; common.

ELAPHRUS Fab.

E. riparius Linn.—H., V, 14 at night on mud flat. 1 specimen.

E. ruscarius Say.—H., IV, 3 under leaves along edge of stream; IV, 16 to 30 at night running on muddy shore of stream; common.

NOTIOPHILUS Dum.

N. aeneus Hbst.—N. C., XI. R., II, III, IV, V, 23, XI, 28, under stones; not uncommon.

N. novemstriatus Lec.—E. M., IV, 7. R., II, III, IV, V, 23, XI, 3, under stones; not uncommon.

N. semistriatus Say.—R., X, 10; M., XI, 6, under stones; rare.

NEBRIA Latr.

N. pallipes Say.—all localities, V. 14 to X; common.

PASIMACHUS Bon.

P. depressus Fab.—L., V, 23 under stones (Coll. by W. R. Walton); rare.

SCARITES Fabr.

S. subterraneus Fab.—R., II, 21, H., IV, V, VI, 8 under stones in damp places; common.

DYSCHIRIUS Bon.

D. globulosus Say.—R., III. N. C., II, IV, V under stones along the Susquehanna. H., VI, 28 (Coll. by P. R. Myers); common.

D. brevispinus? Lec.—H., VI, 19, one specimen (Coll. by P. R. Myers).

CLIVINA Latr.

C. dentipes Dej.—N. C., V, VI, 20 under small stones along shore of Susquehanna; rare.

C. impressifrons Lec.—N. C., H., V, 11th to 15th along river shore under small stones. V, 13 at arc lights; not uncommon.

C. bipustulata Fabr.—H., IV, 9 under stones; V, 13 at arc lights; VI, 3 under stone; common.

SCHIZOGENIUS Putz.

The species of this genus were taken under small stones along the Susquehanna river.

S. lineolatus Say.—N. C., V, VI, VII, 10; common.

S. ferrugineus Putz.—H., V, 22; not common.

S. amphibius Hald.—H., V, 29; not common.

ARDISTOMIS Putz.

A. viridis Say.—N. C., H., V, 15 to 29 under stones along river shore and running on mud banks at night; not uncommon.

PANAGAEUS Latr.

P. fasciatus Say.—H., V, 18 (Coll. by Charles Anderson); E., XI, 7 under stones among ants. Highspire, VIII, 4 under board (Coll. by W. S. Fisher).

BEMBIDIUM Latr.

All the species of this genus were taken most plentifully at night running on mud flats or shores of streams.

B. laevigatum Say.—H., III, 27; X, 12. Taken during day time only under stones and debris along river shore; locally common.

B. inaequale Say.—H., IV, 16 to 30 at night on mud flats; very common.

B. punctatostriatum Say.—H., V, 15 to 24 on island shore at night; rare.

B. confusum Hayw.—H., with the preceding, though more abundant.

B. americanum Dej.—H., V, 7 to 24 on mud flats and island shore at night; not common.

B. honestum Say.—N. C., H.,V, 15 to 24 under small stones along river shore; common.

B. chalceum Dej.—with preceding, N. C., II, 13 under stones; common.

B. rufotinctum Chaud.—R., II, 21 under stone, one specimen.

B. nigrum Say.—H., IV, 16 Pond bank at night; not uncommon.

B. grandiceps Hayw.—N. C., H., V, 15 to 24 under small stones along river shore; common.

B. fugax Lec.—with the preceding R., II, III, XI under stones H., XII, 5; common.

B. ustulatum Linn.—H., III, IV, 30 at night and under stones; very common.

B. graciliforme Hayw.—H., IV, 3 to V, 15 under leaves on muddy bank along creeks in swamp, also at night, XI, 28 under stone; locally common.

B. postfasciatum Ham.—with the preceeding.

B. fraternum? Lec.—H., III, 1. One specimen.

B. variegatum Say.—H., IV, 3 to V, 15; very common.

B. pedicellatum Lec.—N. C., IV, 17 under stone. One specimen.

B. quadrimaculatum Linn.—N. C., H., IV, common under stones, leaves, etc.

B. affine Say.—H., IV at night on muddy shore of stream; not common.

TACHYS, Schaum.

T. nanus Gyll.—E., IV, 24. H., XI, 13 under bark of dead trees; common.

T. flavicauda Say.—E., IX, 3 (Coll. by H. S. Adams).

T. granarius Dej.—H., R., II, III.

T. incurvus Say.—H., IV under stones.

T. tripunctatus Say.—H., N. C., V along river shores under stones.

T. ferrugineus Dej.—E., IV, 24 under bark of dead tree.

T. frontalis Hayw.—H., V, 22.

T. proximus Say.—N. C, V, 15. H., IX, 13; not common.

T. scitulus Lec.—IV, V, common everywhere, under stones, etc., near water.

PATROBUS Dej.

P. longicornis Say.—Common in all localities, II, III, IV, V, VI, IX, and X, usually under stones in damp places.

MYAS Dej.

M. coracinus Say.—R., IX, 18, X, 17 under stones at foot of mountain; rare. R., IX, 23 (Coll. by W. S. Fisher).

PTEROSTICHUS Bon.

P. adoxus Say.—N. C., X, 16. On mountains VI, 20; not common.

P. lachrymosus Newm.—E., III, 27 under stone on mountain; rare.

P. coracinus Newm.—H., XI, 1. One specimen.

P. stygicus Say.—Very common in all localities, II, III, IV, and X, under stones, etc.

P. moestus Say.—Common in all localities, in dead logs, occasionally under stones, V, VII, IX, X, XI.

P. sayi Brulle.—N. M., V; rare.

P. lucublandus Say.—Common everywhere under stones, III, IV, V.

P. ebeninus Dej.—H., IV, 9. Several from rotten log in swamp. XII, 4.

P. caudicalis Say.—H., N. C., IV, V, XI under stones; common.

P. luctuosus Dej.—H., X and XI in swamp, under stones, etc.; not uncommon.

P. corvinus Dej.—II, IV and XI under stones; common.

P. purpuratus Lec.—C., IX to XI in grassy places under stones on hillside overlooking creek; locally common.

P. mutus Say.—Common in all localities throughout the year.

P. erythropus Dej.—H., XI, 19 to 28 under debris in swamp; not common.

P. patruelis Dej.—With the preceding but more abundant.

P. femoralis Kirby.—H., IV, 9. One specimen.

EVARTHRUS Lec.

E. sigillatus Say.—E., III, 21 under stone.

E. furtivus Lec.—H., III, IV and V under stones and at night on mud bank; common

AMARA Bon.

A. pennsylvanica Hayw.—R., X, 10 under board. N. M., X, 30 under stones; not common.

A. avida Say.—H., IV, 11, under stones; not common.

A. exarata Dej.—R., II, 22, IX, 23 under stones; common.

A. angustata Say.—H., III and IV under stones, VI, 14 at arc light. N. C., V, 23. R., III, 21.

A. impuncticollis Say.—R., III, 13 under stones. N. C., V, 5.

A. cupreolata Putz.—R., II, 28. H., III, 1.

A. fallax Lec.—N. C., III and IV. R., III, under stones; common.

A. polita Lec.—H., XI, 19.

A. obesa Say.—N. M., X, 30 under stones; not common.

A. rubrica Hald.—N. C., II, 13. E., XI, 7 under stones; not common.

DIPLOCHILA Brulle.

D. laticollis Lec.—H., II, 16, XI, 28 and XII, 12 from cells in rotten log. N. C., II, 6. N. M., X, 30; common.

DICAELUS Bon.

In all localities where the species of this genus are taken snails are abundant and several species have been observed feeding upon them.

D. dilatatus Say.—N. C., IV. R., V. L., IX, 19. C., IX, 25 under stones; common.

D. purpuratus Bon.—R., IV, 18 under stones. E., IX, 3 (Coll. by H. S. Adams); rare.

D. ovalis Lec.—N. C., H., IV. R., and C., IX under stones; common.

D. elongatus Bon.—Very common in all localities, III, IV, V and IX.

D. teter Bon.—With preceding; common.

D. politus Dej.—With preceding; common.

BADISTER Clairv.

B. notatus Hald.—E. M., II, 6 (Coll. by H. S. Adams). H., III,27 under stones, XII, 18 sifting. N. C., IV, V, X, 16, under stones. usually in single specimen.

CALATHUS Bon.

C. gregarius Say.—Common in all localities throughout the year under stones.

C. opaculus Lec.—E., III, 20. R., X, 10. H., XI and XII under stone and logs; not uncommon.

PLATYNUS Bon.

P. sinuatus Dej.—H., throughout the year, under stones, IV at night running along shore of stream; common.

P. cincticollis Say.—H., throughout the year, in logs and under stones, also taken at arc lights.

P. extensicollis Say.—Common everywhere, IV, V, and X.

P. decorus Say.—H., II, III, IV, and V under stones in swamp; not common.

P. anchomenoides Rand.—H., V, 5 along river shore under stones. X and XI under stones; not common.

P. moerens Dej.—H., IX to XI in log; rare.

P. melanarius Dej.—H., N. C., IV, XI and XII common in dead logs, under leaves and stones, in swampy places, also at night.

P. affinis Kirby.—H., R., II, and XI in swamp.

P. cupripennis Say.—R., III, 13 under stones. N. C., III, 21 and X, 16 under stones along lane; common.

P. excavatus Dej.—H., IV and V at night along shore of creek; not uncommon.

P. ferreus Hald.—With the preceding; more common.

P. nutans Say.—R., II, 28. N. M., X, 30 under stones; rare.

P. octopunctatus Fabr.—R., III, and VI under stones; locally common.

P. placidus Say.—Common in all localities throughout the year.

P. bogemanni Gyll.—N. C., H., V, 15 to 20, VII, 12 along river shore under stone. H., VII, 29 at arc light.

P. aeruginosus Dej.—R., II, 28.

P. crenistriatus Lec.—E., III, 20. R., N. C., N. M, X under stones; common.

P. punctiformis Say.—C., XI, 6. One specimen under stone.

P. picipennis Kirby.—H., IV and XI under logs and stones; very common.

P. lutulentus Lec.—R., II, III and X. H., XI, 13 under stones and in dead logs; not uncommon.

OLISTHOPUS Dej.

O. parmatus Say.—H., II, 12, XI and XII under dry leaves; rare.

ATRANUS Lec.

A. pubescens Dej.—H., C., IV and XI in and under dead logs; not common.

CASNONIA Latr.

C. pennsylvanica Linn.—All localities; common. II, V, IX and XI.

GALERITA Fabr.

G. janus Fabr.—Common everywhere throughout the year.

G. bicolor Dru.—H., VIII, 1; not common.

TETRAGONODERUS Dej.

T. fasciatus Hald.—E. M., IV, 19 under stones in sand near creek. H., VI, 14 running in sand along river shore (Coll. by W. R. Walton). N. C., XI, 7 under stone; not common.

LEBIA Latr.

L. grandis Hentz.—Common under stones and logs in all localities, from September to beginning of April.

L. atriventris Say.—H., III, and IV, with the preceding; not common.

L. viridis Say.—Common in all localities on flowers, especially golden rod, from April to September inclusive.

L. pumila Dej.—L., IX, 12 on flowers of golden rod.

L. viridipennis Dej.—H., II, 12. E., III, 27. N. C., V, 23, under stones and logs; not common.

L. ornata Say.—L., IX, 19 on flowers of golden rod; not common.

L. scapularis Dej.—R., II, 21, IV, 11, under stones. C., V, 31 flying; rather rare.

COPTODERA Dej.

C. aerata Dej.—H., VI, 30 to VII, 14 taken only at night running over trunks of dying and infested hickory trees; rare.

APRISTUS Chd.

A. cordicollis Lec.—E., V, 29. Running about in day time on shale-bank. (Coll. by W. R. Walton).

BLECHRUS Mots.

B pusio Lec.—N. C., II, 13 under stones.

METABLETUS Schm.-Goeb.

M. americanus Dej.—H., R., II, III, and XI, 28 under logs and stones.

PLOCHIONUS Dej.

P. timidus Hald.—N. C., XI, 16. Highspire, III, 30; XI, 29 under bark of hickory and fallen oak trees. (Coll. by W. S. Fisher).

PINACODERA Schaum.

P. limbata Dej.—Common in all localities under stones and leaves, II, III, V, IX, and XI.

P. platicollis Say.—Same as the preceding.

CYMINDIS Latr.

C. americana Dej.—All localities, always taken singly under stones, in dead logs, etc. From October to beginning of May.

C. pilosa Say.—R., VII, 4, X, 10; E.. XI. 7 under stones. H., VII, 1 to 13 at arc lights; common.

C. neglecta Hald.—R., all year around under stones; not rare locally. E., III, 27.

APENES Lec.

A. lucidula Dej.—All localities, singly under stones, III, IV, VI and XI. H., VI, 14 at arcs.

A. sinuata Say.—N. C., II, 13. R., II, and III. L., IV, 18. Under stones. H., VI, 21 at arc lights; not common.

HELLUOMORPHA Lap.

H. bicolor Harr.—R., V, 8; IX, 18 under stones at foot of mountain; two specimens.

BRACHYNUS Web.

B. perplexus Dej.—H., II, 27, IV and V under stones.

B. fumans Fab.—H., R., IV and V.

B. cordicollis Dej.—H., V, 11th.

CHLAENIUS Bon.

C. sericeus Forst.—Common in all localities III, IV, IX and XI. Under stones early in the season. In May plentiful at night along shores of streams mating and feeding.

C. laticolis Say.—N. M., V, 8 and X, 30, under stones along small stream.

C. aestivus Say.—Very common in all localities throughout the year.

C. prasinus Dej.—H., N. C., V, 15 to 30 under stones and running along river shore at night. IX, 12 to 23 under stones; locally common.

C. leucoscelis Chev.—Same as preceding; very plentiful.

C. nemoralis Say.—N. C., III, 21 under stones. H., IV, 3 under stones, VII, 31 at arc lights; common.

C. tricolor Dej.—N. C., III, 21. H., IV, V, under stones.

C. pennsylvanicus Say.—With the preceding; both common.

C. impunctifrons Say.—H., IV, V under stones and at night on muddy banks of creek in swamp; locally common.

C. tomentosus Say.—N. C., III, 13 under stones. H., V, VI at arc lights; common.

ANOMOGLOSSUS Chd.

A. emarginatus Say.—Common in all localities throughout the year under stones, logs, etc.

BRACHYLOBUS Chd.

B. lithophilus Say.—H., IV under leaves and at night running along muddy banks of stream in swamp, mating, feeding, etc.; locally common. N. C., V, 30; one specimen.

LACHNOCREPIS Lec.

L. parallelus Say.—H., IV, 3 to 22 under leaves and stones along bank of stream, IX, 28 and XI, 27 under stones in swamp. Usually in single specimens; not common.

OODES Bon.

O. fluvialis Lec.—H., XI and XII several from cells in dead log in swamp. H., IV, 4 (Coll. by W. S. Fisher).

GEOPINUS Lec.

G. incrassatus Lec.—H., V, 22 dug in numbers from sandy shore of island and seemed more plentiful at roots of a certain plant, V, 24 at night running along island shore, X, 2 under stones in sand, VI, 21 at arc lights in city.

CRATACANTHUS Dej.

C. dubius Beauv.—H., VIII, 19 (Coll. by Charles Anderson).

AGONODERUS Dej.

A. lineola Fab.—H., VI under stones and at arc lights; not uncommon.

H. caliginosus Fabr.—Common everywhere. H., VI and VII at arc IV to VII, XI and XII.

A. partiarius Say.—E., V, 13. N. C., V, 7 to 23; not uncommon.

HARPALUS Latr.

H. dichrous Dej.—Common in all localities under stones, II to V, IX and XI.

H. vulpeculus Say.—Same as preceding.

H. autumnalis Say.—E., III, 27, IV, 4. H., IV, 16, V, 13. R., IV, 18 under stones.

H. viridiaeneus Beauv.—H., V, 13. One specimen, (Coll. by E. Daecke).

H. caliginosus Fabr.—Common everywhere. H., VI and VII at arc lights.

H. faunus Say.—N. M., X, 30.

H. convivus? Lec.—R., IV, 11th. N. M., V, 8. L., IX, 19.

H. vagans Lec.—N. M., X, 30.

H. pennsylvanicus DeG.—Common everywhere.

var. compar Lec.—N. C., IV, 25. H., VI, 23.

var. longior Kirby.—R., V, 23, IX, 18.

var. erythropus Dej.—Common in all localities, V to VII and IX to XI.

H. spadiceus Dej.—R., IV, 18, X, 10 under stones; not common.

H. herbivagus Say.—N. C., II, 27. H., V, 13; X, 12. N. M., X, 30.

H. nitidulus Chd.—N. C., IV, 17, 2 specimens.

SELENOPHORUS Dej.

S. opalinus Lec.—H., V and VI. E., IX, 26. L., VI, 6; not uncommon.

STENOLOPHUS Dej.

S. fuliginosus Dej.—N. M., X, 30. H., IX, XI. R., XI. Under stones; rather common.

S. plebeius Dej.—R., X and IX in swamp.

S. conjunctus Say.—Common in all localities under stones, etc. II, III, and XI.

S. ochropezus Say.—Common in all localities IV and XI.

ACUPALPUS Latr.

A. carus Lec.—H., XI under stones in swamp.

BRADYCELLUS Er.

B. rupestris Say.—N. C., II and V. E., V, 13. H., III and IV. Common under stones.

TACHYSCELLUS Moraw.

T. atrimedius Say.—R., II, III and XI. H., IX, 13. C., XI, 6. Under stones; rather common.

T. badiipennis Hald.—R., II, IV, X, XI. N. C., IV. E., IV; not uncommon.

ANISODACTYLUS Dej.

A. rusticus Say.—R., III, 21. H., V, 5. Under stones, VII. 31 at arc lights. L., IV, 27.; common.

A. carbonarius Say.—H., VII, 13. N. M., X, 30; not common.

A. agricola Say.—C., X, 2; XI, 14 (Coll. by W. S. Fisher).

A. harrisii Lec.—H., V, 9.

A. nigerrimus Dej.—Common in all localities, II to V and IX, X, and XII.

A. melanopus Hald.—H., II, 12; IV, 22.

A. discoideus Dej.—Common everywhere, under stones and at arc lights. IV to VI and IX to XII.

A. baltimorensis Say.—R., II, III, IV and X under stones. H., XI and XII from dead logs in swamp; common.

A. verticalis Lec.—H., V, 22. One specimen.

A. terminatus Say.—H., VII, common at arc lights. N. M., X, 30 under stones.

A. nitidipennis Lec.—Common in all localities, II to VI and IX to XI under stones sometimes in small cell.

A. lugubris Dej.— H., II, 16. E., III, 27. R., III and IX, 23. Under stones.

A interstitialis Say.—Common in all localities, II, IV, V, IX and XI.

On the Classification of the Lyttidae (Meloidae s. Cantharidae auctt.).

By Creighton Wellman.

As a result of some study of the Coleopterous family known as the Meloidae or Cantharidae I have decided upon a grouping of these insects which seems to me to express many of the natural characters of the family in so far as these can be shown in a linear table. In order that the final arrangement may be acceptable to the greater part of those scientists who work with the group, I am publishing the following outline of

my classification in the hope of receiving criticisms and suggestions which will help in perfecting it. I will be under great obligations to all entomologists who will write me their views both regarding the general idea and the detailed carrying out of it as laid down in this essay.

Before taking up the question of arrangement it should be said that the name which should be used to designate the blister beetles is Lyttidae. The reasons for this are evident. No one with material before him from all parts of the world can escape the conviction that the genus *Lytta* F. (*Cantharis* Aucct.), with its allies, is the typical one of the family and the one from which the student should start in his study of the phylogeny of the whole group. The family name Meloidae is entirely inappropriate, as the genus *Meloe* L. is nearly as atypical as any genus so far described. The long accepted family name Cantharidae already exists in the literature, and if we follow the International Code of Zoological Nomenclature* we should, on the substitution of *Lytta* F. for *Cantharis* Geoffr., regard Lyttidae as *ipse facto* becoming the proper designation of the family. Such terms as "Vesicants," etc., are to be considered as having no nomenclatorial status whatever. Thus we have:

Fam. Lyttidae,
Type Genus LYTTA Fabricius (1775).
Synn. Meloidae Auctt.
Cantharidae Auctt.

Various groups not belonging to the family have by various authors been included in it. One of these (*Cephaloon* Newm. and its allies) has been regarded until recently as being blister beetles, but an examination of the larva of *Cephaloon* shows that it has nothing to do with our family. In the case of the true Lyttidae the usual difficulties of classification are greatly enhanced by the wonderful effects of peculiar parasitic habits evinced in the hypermetamorphosis of the earlier stages no

*Art. 5. "The name of a family or sub-family is to be changed when the name of its type genus is changed."

less than in the remarkable degenerations and specializations of certain of the adults. We have widely differing opinions as to the value of some of the characters used in classification. Were it not for intermediate forms any systematist would put in different families an apterous *Meloe* with reduced, dehiscent, imbricate elytra and a *Nemognatha* with normal elytra, wings and maxillary lobes as long as its body. It cannot be too strongly emphasized that the forms from the western hemisphere must be largely taken into account in deciding upon a general classification of the entire family.

In presenting my own ideas on the grouping of the Lyttidae it will be well to recall briefly some of the attempts* which have already been made to provide a classification.

Linné (Systema Naturae, 1758) included the insects described by him and belonging to this family under his genus *Meloe,* and even in the last edition of the work mentioned he introduced no further sub-divisions of the group.

Geoffroy (Histoire abregée des Insectes, 1761) adopted Linné's genus *Meloe,* restricting it to include only the wingless blister beetles with dehiscent elytra, and creating two new genera for the remaining species then known.

Latreille (Charactères génériques des Insectes, 1796; Histoire naturelle des Crustacées et des Insectes, 1804; Considerations generales sur l'Ordre naturelle des Animaux, 1809; Règne animal de Cuvier, 1817, also last edition, 1829, etc.) proposed several arrangements of the existing genera and added other genera. Latreille showed wonderful acumen in his work on the group and his writings are still of value. To the last he persisted in regarding *Horia* and *Cissites* as distinct from the other members of the family.

Leach (Edinburgh Encyclopedia, 1815) divided the blister beetles into three families, viz., 1. Cerocomatidae (*Cerocoma, Mylabris*), 2. Meloidae (*Oenas, Meloe*), 3. Cantharidae (*Cantharis, Zonitis, Nemognatha, Apalus*). This is the first at-

*An excellent resumé of these and other classifications, covering the period from 1758 to 1859, is to be found in Mulsant, Histoire naturelle des Coléoptéres de France, Vésicants, pp. 14-27.

tempt to introduce sub-divisions into the group, and is of much historical interest.

Castelnau (Histoire naturelle des Insectes Coléoptères, 1840) also proposed three groups, but as follows: 1. Meloites (*Meloe*), 2. Mylabrites (*Cerocoma, Mylabris, Lydus*), 3. Cantharidites (*Oenas, Cantharis, Lytta, Zonitis, Apalus, Sitaris*), 4. *Nemognatha.*

Redtenbacher (Die Gattungen der Deutschen Käfer nach der analytischen Methode bearbeitet, 1845) without adopting the names of any of the previously proposed subdivisions, devised the best systematic tables for the genera and species ever published up to his time.

Motschulsky (Coléoptères recus d'un Voyage de M. Handschuh dans le midi de l'Espagne, 1849) put forth three divisions of the family, viz.: 1. Obesicornes (*Mylabris, Dices*), 2. Lobaticornes (*Meloe*), 3. Gracilicornes (*Zonitis*, etc.).

Mulsant (Histoire naturelle des Coléoptères de France, 1857) attempted a detailed grouping of the family with the following result: I. Meloidiens (*Meloe*), II. Mylabriens (1. Cerocomaires, *Cerocoma;* 2. Mylabriaires, *Hycleus, Mylabris*); III. Cantharidiens (1. Cantharidiaires, a. Alosimates, *Alosimus;* b. Cantharidiates, *Cantharis, Epicauta* 2. Zonitaires, a. Zonitates, *Zonitis, Nemognatha, Apalus;* b. Sitarates, *Stenoria, Sitaris*).

Lacordaire (Genera des Coléoptéres, 1865) proposed two subfamilies under the last of which he placed five tribes, thus: I. Meloides vrais (*Meloe, Cysteodemus, Henous*); II. Cantharides (1. Horiides, *Horia, Cissites,* 2. Mylabrides, *Cerocoma, Mylabris,* 3. Cantharides vrais, *Eletica, Tetraonyx, Phodaga, Tegrodera, Cantharis, Spastica, Oenas, Lydus, Sybaris, Cephaloon, Palaestra, Tmesidera, Zonidis, Apalus, Palaestrida,* 4. Sitarides, *Sitaris, Onychtenus, Sitarida,* 5. Nemognathides, *Nemognatha, Gnathium*). Lacordaire's work had a wide influence and his ideas have been followed by most entomologists since.

Le Conte (Classification of the Coleoptera in the Smithsonian Miscellaneous Collection, 1862) and LeConte and Horn

(Classification of the Coleoptera of North America, 1883) adopted a scheme similar to Lacordaire's which has colored the views of most American coleopterologists. In its final form it consisted of: I. Meloini (*Cysteodemus, Megetra, Meloe, Henous, Poreospasta*), II. Cantharini (1. Horiini, *Horia, Tricrania*), 2. Nemognathini (*Nemognatha, Gnathium, Zonitis*), 3. Sitarini (*Hornia, Leonia*), 4. Mylabrini (*Cordylospasta*), 5. Cantharini genuini (a. Macrobases, *Macrobasis*, b. Cantharides, *Tetraonyx, Pleuropompha, Gnathospasta, Epicauta, Pyrota, Pomphopoea, Cantharis, Calospasta, Tegrodera*, c. Eupomphae, *Eupompha*, d. Phodagae, *Phodaga*).

Fairmaire (Genere des Coléoptères d'Europe, 1863) has arranged the family in this manner: I. Meloites, II. Cantharites, 1. Mylabrites (*Cerocoma, Coryna, Mylabris*), 2. Cantharites propres (*Oenas, Lydus, Cabalia, Lytta, Lagorina, Cantharis*), 3. Sitarites (*Stenodera, Hapalus, Sitaris, Ctenopus*), 4. Zonitites (*Zonitis, Nemognatha, Leptopalpus*).

Gemminger and Harold (Catalogus Coleopterorum, 1870) employed no subdivisions whatever in their arrangement of the family. They accepted forty-two of the genera which had been proposed, disposed in the following order: *Meloe, Nomaspis, Pseudomeloe, Cysteodemus, Henous, Gynapteryx, Horia, Tricrania, Apteropasta, Cissites, Rhampholyssa, Cerocoma, Diaphorocera, Coryna, Mylabris, Iletica, Tetraonyx, Jodema, Phodaga, Calospasta, Tegrodera, Eupompha, Cantharis, Spastica, Oenas, Lydus, Halosimus, Sybaris, Cephaloon, Palaestra, Tmesidera, Zonitis, Hapalus, Palaestrida, Sitaris, Sitarida, Onychtenus, Goetymes, Ctenopus, Nemognatha, Gnathium.*

Beauregard (Les Insectes Vésicants, 1890) arrived at the following classification: 1. Zonitites (*Nemognatha, Gnathium, Zonitoides, Zonitis, Stenodera, Hapalus, Leptopalpus*), 2. Sitarites (*Ctenopus, Onyctenus, Stenoria, Sitaris, Sitarida, Goetymes, Sitarobrachys, Hornia, Leonia*), 3. Meloites (*Meloe, Pseudomeloe, Poreospasta, Megetra, Cysteodemus, Nomaspis, Gynapteryx*), 4. Cantharites, a. Horiides (*Horia, Cissites, Tricrania*), b. Cantharides (*Tetraonyx, Spastica, Cantharis*), 5. Lyttites (*Henous, Apterospasta, Macrobasis, Epicauta, Pyrota,*

Iletica, Calospasta, Iselma, Phodaga, Eupompha), 6. Mylabrites (*Lydus, Alosimus, Oenas, Mylabris, Cerocoma, Cephaloon, Sybaris, Rampholyssa, Diaphorocera, Cordylospasta*). Beauregard's work is epoch-making, more from its method and influence than from its actual conclusions however. He was the first to base divisions on larval as well as adult characters and, while his interpretations are not so important as his data, his monograph is a foundation stone of a natural classification.

Champion (Biologia Centrali-Americana, 1893) adopted the following groups: 1. Meloinae (*Meloe, Henous, Cysteodemus, Megetra*), 2. Cantharinae, a. Horniides (*Leonia*), b. Horiides (*Horia*), c. Nemognathides (*Nemognatha, Gnathium, Zonitis*), d. Cantharides (*Tetraonyx, Eupompha, Calospasta, Macrobasis, Gnathospasta, Epicauta, Pyrota, Cantharis*).

Escherich (Bestimmungs-Tabelle der europäischen Coleopteren, 1897) proposed the following grouping: 1. Meloidae (s. str.), a. Meloini, b. Lyttini, 2. Zonitidae, a. Cephaloonini, b. Zonitini. Escherich deserves the credit of being the first to see that the family falls naturally into two great divisions, one of which is typified by the genus Zonitis.

Von Heyden, Reitter and Weise (Catalogus Coleopterorum Europae, etc., 1906) put forth the following: 1. Meloini (*Meloe, Proscarabaeus, Sitarobrachys*), 2. Lyttini (sic)* (*Cerocoma, Rampholyssa, Zonabris* (*Hycleus*), *Oenas, Calydus, Lydus* (*Halosimus*), 3. Lyttini (*Lytta* (*Teratolytta*), *Lagorina, Cabalia, Epicauta, Zonitis, Euzonitis, Cochliophorus, Stenodera, Nemognatha, Leptopalpus, Hapalpus* (*Criolus*), (*Stenoria*), *Sitaris, Ctenopus*).

Ganglbaur (Verh. zool.-bot. Gesellsch. Wien, 1907) modified Escherich's (1897) idea as follows: 1. Meloinae, a. Lyttini (*Epiacuta, Lytta, Lagorina, Cabalia, Lydus, Calydus, Oenas, Mylabris, Cerocoma, Rampholyssa*), b. Meloini (*Meloe, Sitarobrachys*), 2. Zonitinae (*Hapalus, Stenoria, Sitaris, Ctenopus, Stenodera, Cochliophorus, Leptopalpus, Zonitis, Nemognatha*).

Before presenting my own classification which lays stress upon phylogeny, as against pure taxonomy, for a guiding

*Probably a *lapsus calami* for Zonabrini.

principle, it may be well to remark on some of the crucial genera upon which turn the groupings adopted. It will be seen that I regard some genera formerly considered to be closely allied as widely separate, and *vice versa*. The chief character relied on by Lacordaire and his followers in dividing the family into two unequal groups is the length of the metasternum, which in *Meloe* et al. is very short, allowing the middle coxae to overlap the hind coxae. This is entirely an artificial character in this connection and is of course due to atrophic changes following on the loss of the insect's wings in the course of evolution. Occasional absence of wings in a family is not so important a character in the Coleoptera as has been supposed. This is well illustrated in the Carabidae. In that family I have even had brought to my notice by Dr. Walther Horn of Berlin a single apterous specimen of a usually winged species (*Calosoma reticulatum*).* The weakness of the received classification of the blister beetles is well illustrated by such forms as *Henous* (an apterous *Lytta*), *Apterospasta* (an apterous *Macrobasis*) and especially by the insect known as *Calospasta opaca* G. H. Horn, which I have tried to fit in Fairmaire and Germain's genus *Gynapteryx*, but for which I now propose a new genus, viz.:

GYNAECOMELOË Wellm. gen. nov.

♂ with general form as in *Tetraonyx* Latr. and some species of *Calospasta* Lec. Elytra as long or longer than the body, provided with wings, metasternum long, mesocoxae not overlapping hind coxae.

♀ with general form as in *Meloe* L., elytra much shorter (often less than half) than the body, apterous, metasternum short, mesocoxae overlapping hind coxae.

Claws and other characters as in *Calospasta* Lec.

*Since this was written, Dr. E. C. Van Dyke has called my attention to other equally interesting instances of wing degeneration in the genus *Calosoma* from the Galapagos Islands, among the Scarabaeidae from the same region and especially in the Family Tenebrionidae, from the Pacific Coast region.

Type species *Calospasta opaca* G. H. Horn.

This genus cannot be confused with any other. From *Gynapteryx* Fairm. et Germ. (which is a *Henous* with winged ♂ ♂) it can easily be told by its unequal claws and short elytra of the ♀.

Other apterous forms occur in various divisions of the family, such as *Hornia* and *Leonidia* (Sitarini) and *Tricrania* (Horiini), but should not have too much stress laid on them from the standpoint of general classification, although the presence or absence of wings among the Lyttidae is usually a good generic character.

Taking up now in order some of the genera helpful in deciding on a scheme of classification I may say that *Sybaris* should probably be regarded as related to the *Mylabris* group, although its claws have the superior division pectinate. This relation can be traced through *Alosimus, Lydus* and *Oenas* to *Mylabris*. The mouth parts of *Oenas* and *Alosimus* are very like *Mylabris* (the mandibles being dissimilar, i. e., the right and left mandible different), *Lydus* being a little farther removed in this respect. *Cordylospasta* is to be considered as also rather near *Mylabris,* although its generalized features are not so like as its appearance suggests, and the antennal and other common characters may possibly be due simply to parallel development. Its claws, etc., place *Cordylospasta* near *Cysteodemus, Megetra* and the *Calospasta* group of genera. The larval no less than the adult characters of the *Cerocoma* and *Mylabris* groups place them close tokether. *Eletica,* while having some points in common with the Mylabrines, is by virtue of its having mouth parts like *Pyrota* (i. e., with all the parts differentiated and isolable) is a link between the group last mentioned and the Lyttines.

The gradations in the *Lytta* division (through the series of genera allied to *Calospasta*) toward the Meloines are gradual and evident. The genera *Henous, Gynapteryx, Gynaecomeloë,* etc., have already been mentioned in this connection.

Between the *Meloe* forms and the *Sitaris* tribe the break is on the whole greatest and it is here that I propose to divide

the genera composing the family into two divisions. Still there are not wanting suggestions of relation, such apterous genera as *Hornia* and *Sitarobrachys* (with short metasterna and overlapping coxae) distinctly recalling Meloine forms.

From the genera last mentioned with their allies we come without great gaps through the Sitarine group to the Zonitines, such genera as *Onychtenus* and *Stenodera* furnishing the passage.

In the *Zonitis* group I should mention *Deridea* and probably *Iselma,* remarkable on account of their non-pectinate claws. The other genera here are close together, *Palaestra* for instance being only a *Zonitis*-mimicry of a *Lycus,* and *Nemognatha* a *Zonitis* with specially developed mouth parts. Gradations of both these last forms occur.

The mouth parts, episterna and claws all unite to connect the Zonitines with the *Horia* group, although the absence of vesicating properties and other features make these last rather distinct.

The peculiar little group of species now included under the genus *Tricrania* Lec. is of great significance in any classification of the family. In some of their features recalling the Sitarini, they are obviously allied to *Horia* and *Zonitis.* The claws of *Tricrania sanguinipennis* are those of a *Cissites,* while those of *stansburii* strongly suggest *Zonitis.* A new genus is required for the proper expression of the relation which these insects hold to the groups mentioned, namely,

TRICRANIODES Wellm. gen. nov.

Allied to *Tricrania* Lec., from which it differs by the claws being simply pectinate with longish regular teeth instead of a double row of short tubercles, and also by the body being winged (it is apterous in *sanguinipennis* Say., the first described species of the group, and which may now be regarded as the type of *Tricrania* Lec. s. str.)

Other characters as in *Tricrania* Lec.

Type species *Tricrania stansburii* Hald.

The genus is easily distinguished from *Tricrania* by the absence of wings in the latter.

These two allied genera are to be regarded as connecting the Horiines (through the *Zonitis* group) with the rest of the Lyttidae.

To sum up in a word what has been said regarding the various genera, the family Lyttidae contains two chief and fairly homogenous divisions which are related to each other principally through the *Sitaris* and *Meloe* groups of genera.

On the ground of the foregoing and many other considerations I am dividing the blister beetles into two sub-families which I separate as follows:

Fam. **LYTTIDAE** (Cantharidae s. Meloidae Auctt.)

A. Pseudochrysalis not confined in exuvia of preceding larval instar, ♂ genitalia disposed vertically or obliquely in abdomen ..... **Lyttinae** nov.

AA. Pseudochrysalis confined in exuvia of preceding larval instar, ♂ genitalia disposed horizontally in abdomen, **Zonitinae** Ganglb.

Under these sub-families six tribes should be recognized as follows:

Subfam. **Lyttinae** nov.

A. Wings present, elytra normal.

a. Antennae usually clavate, mandibles often dissimilar, **Mylabrini** nov.

aa. Antennae never clavate, mandibles similar.....**Lyttini** Lec.

AA. Wings absent at least in ♀, elytra usually dehiscent, sometimes imbricate .....**Meloini** Esch. s. str.

Subfam. **Zonitinae** Ganglb.

A. Labrum distinct.

a. Elytra reduced or dehiscent, maxillary lobes normal, **Sitarini** nov.

aa. Elytra normal, maxillary lobes sometimes greatly produced, **Zonitini** Esch. s. str.

AA. Labrum small, sometimes hardly visible.....**Horiini** Lec.

In conclusion I give my grouping of the genera known to me, which is as yet tentative in some parts, and on which I especially invite criticisms and suggestions.

Fam. LYTTIDAE.

Subfam. LYTTINAE.

Trib. **Mylabrini**

Group *Sybarides.*

Sybaris.

Lydomorphus, Lydus, Alosimus, Oenas, (Paroenas).

Group *Cordylospastides.*

Cordylospasta.

Group *Cerocomides.*

Rampholyssa, Cerocoma, Diaphorocera.

Group *Mylabrides.*

(Lydoceras, Ceroctis), Mylabris, (Decapotoma, Coryna, Actenodia).

Group *Eleticides.*

Eletica.

Trib. **Lyttini.**

Group *Lyttides.*

Pyrota, Epicauta, (Macrobasis, Causima), Lytta, (Teratolytta, Lagorina, Cabalia), Pleuropomph, Gnathospasta, Lyttonyx, Spastica, Tetraonyx.

Group *Calospastides.*

Phodaga, Negalius, Eupompha, Tegrodera, Pleuropasta, Calospasta.

Trib. **Meloini.**

Group *Gynaecomelodides.*

Gynaecomeloe.

Group *Cysteodemides.*

Cysteodemus, Megetra.

Group *Apterospastides.*

Poreospasta, Apterospasta, Gynapteryx, Henous.

Group *Meloides.*

Melöe, Meloëtyphlus.

Subfam. ZONITINAE.

Trib. **Sitarini.**

Group *Horniides.*

Hornia, Leonidia, Sitarobrachys, Sitarida.

Group *Sitarides.*

Sitaromorpha, Glasnuvia, Sitaris, Stenoria, Ctenopus, Onyctenus.

Trib. **Zonitini**
Group *Derideides.*

Deridea, Iselma.

Group *Zonitides.*

Stenodera, Palaestra, (Tmesidera), Cochliophorus, Zonitis, (Euzonitis), Zonitoides.

Group *Nemognathides.*

Gnathium, Nemognatha, Leptopalpus.

Trib. **Horiini**
Group *Tricraniides.*

Tricraniodes, Tricrania.

Group *Horiides.*

Cissites, (Synhoria), Horia.

The Genus Copestylum.

By J. M. Aldrich, Moscow, Idaho.

The genus under consideration belongs to the dipterous family Syrphidæ, and is closely related to *Volucella*, an immense assemblage of mostly rather large flies having a Southern range. The only generic character which sets off *Copestylum* is the structure of the arista, which is covered, especially above and toward the apex below, with closely set, short, black, flattened hairs, giving it under the microscope a little the appearance of a black ostrich plume. In *Volucella* the arista is of ordinary structure, more or less plumose with the usual long, thin, tapering hairs.

The first member of this genus to become known to science was *marginatum*, described as a *Volucella* by Say (a). His material was from Mexico, and from the wording must have consisted of a single specimen of each sex.

Macquart (b) described the genus and founded it upon the species *flaviventris*, from Colombia. He mentions two females.

Osten Sacken (c) recognized Say's species (as a *Volucella*) from Waco, Texas, in a single specimen; in (d) he correctly places *marginatum* under the genus *Copestylum*, and suggests that *flaviventris* may be a synonym.

Williston (e) puts Macquart's species as a synonym of *mar-*

ginatum, of which he identified thirty specimens from Texas, Arizona, Montana and California. The specimens showed great variation; nine from Montana might be distinct, of smaller size; one variety, *lentum,* he designates by a name. A single additional specimen from the Isthmus of Tehuantepec, he believed to be distinct and named it *C. limbipennis.* In (f) he identifies additional specimens of *marginatum* from Central America, and of both sexes of *limbipennis* from three Mexican localities. Later in (g) he records the rearing of *marginatum* from larvae boring in the tissues of *Opuntia,* a common cactus of the arid regions.

From this summary of Williston's work on the genus it will be seen that he examined large numbers of specimens, probably as many as sixty, and could make out but two species.

Giglio-Tos, the Italian entomologist, who worked for some years on Mexican Diptera, described two new species in (h), which he called *simile* and *parvum;* later in the same year (i) he reprinted these descriptions and separated a third species, *distinctum,* from *marginatum* on account of the smaller size of the latter (with other slight differences); he redescribes *marginatum,* and figures both it and *distinctum.* All four of his species were collected at Tehuacan, Mexico, and *simile* also at Meztillan. He had 7 *marginatum,* 11 *distinctum,* 2 *simile,* 1 *parvum.*

In (j) Mr. C. H. Tyler Townsend reported on a lot of Diptera from Lower California, among which he identified a number of species of *Volucella,* mostly new, but mentioned no species of *Copestylum.* His type material was deposited in the collection of the California Academy of Sciences at San Francisco, where I made a careful examination of it only a few weeks before it was entirely destroyed by the freat fire. To my surprise, I found that his *Volucella estebana, lucasana, sodomis* and *tolteca* were all *Copestylums.* The specimens of *tolteca* were not the types, and in looking up the original description in another paper (k), I found another series of species, *fax, inops* and *tolteca,* so connected together in the descriptions as to leave scarcely a doubt that they are all *Copestylums.* The

first one of the series, *fax*, is said to have the "arista thickly plumose above, and a little on apex below," which corresponds with the expression used in describing *estebana*—"arista densely short plumose above." The three species are closely interwoven in the descriptions, and the third I found to be a *Copestylum* by examining material identified by Townsend himself; hence I feel certain that *fax* and *inops* may be added to the list to be transferred to *Copestylum*. In (l) Townsend for the first time in print identifies a species of *Copestylum*, mentioning a specimen of *marginatum* from New Mexico. All of Townsend's species are based on meagre materials—in fact, he hade seven species out of a total of eleven specimens.

Snow (m) placed all three of Giglio-Tos's species as doubtful synonyms of *marginatum*.

In my catalogue (n), I allowed *limbipennis*, *parvum* and *simile* to stand as valid species, not that I had any opinion on the subject, but merely giving them the benefit of the doubt. *Distinctum*, however, seemed to me to come well within the range of variation of *marginatum*, so I placed it as a synonym of that species. I had not at that time examined Townsend's material, so I put all his species in the genus to which he assigned them.

The specific names to be considered under the genus *Copestylum* appear to be the following: *Marginatum* of Say; *flaviventris* of Macquart; *limbipennis* of Williston; *distinctum*, *parvum* and *simile* of Giglio-Tos; *estebana*, *lucasana*, *sodomis*, *tolteca*, *inops* and *fax* of Townsend.

Bigot does not mention any Copestylums, and among the numerous descriptions of Volucellas given by him I have searched in vain for any mention of an antennal character indicating a *Copestylum;* still the omission signifies little, and it is not unlikely that an examination of his types will disclose several species of this genus.

We are now at the threshold of the main question, which is, how many species of *Copestylum* actually exist, and which names apply to them? But here I regret to say I must stop. I have gathered up the threads so as to simplify the problem

a little, but the material within my reach is far too meagre to enable me to form a satisfactory conclusion.

Probably Melander and Brues examined more material in the genus than has been accessible to any other dipterists, as in their two years' stay in Texas they collected about a hundred specimens, most of which they distributed in exchange. Out of this number, a single one was classified as *lentum*, all the rest as *marginatum*. I am indebted to Prof. Melander for this suggestive item.

(a) Say, Jour. Acad. Nat. Sci. Phil., VI, 167, 1829; reprinted in Complete Works, II, 360.
(b) Macquart, Dipt. Exotiques, Suppl. I, 252 (sep. 124), 1846; pl. X, fig. 16.
(c) Osten Sacken, Western Dipt., 333, 1877.
(d) Osten Sacken, Catalogue of N. A. Diptera, 2d edition, 1878, 130.
(e) Williston, Synopsis N. A. Syrphidae (Bull. 31, U. S. Natl. Mus.), 151, pl. VII, f. 1; 1886.
(f) Williston, Biologia Cent. Amer., Dipt. III, 56, 1891.
(g) Williston, Entomological News, II, 162, 1891.
(h) Giglio-Tos, Boll. Mus. Zool. Anat. Comp. R. Univ. Torino, VII, No. 123, p. 2; 1892.
(i) Giglio-Tos, Ditteri del Messico (Mem. R. Acad. Sci. di Torino, ser. II, tom. XLIII, 1892), 40-43, pl. I, f. 14, 15.
(j) Townsend, Proc. Cal. Acad. Sci., 2d ser., IV, 612-616, 1895.
(k) Townsend, Trans. Amer. Ent. Soc., XXII, 42-45, 1895.
(l) Townsend, Psyche, 1898, 267.
(m) Snow, Suppl. List N. A. Syrph. (Kans. Univ. Quart., III, 1895), 257.
(n) Aldrich, Catalogue N. A. Diptera (Smithsonian, 1905), 376.

Dr. Edwin C. Van Dyke and Dr. F. E. Blaisdell, of San Francisco, expect to make a collecting trip to the high middle Sierras of California. Coleoptera are warned to steer clear of the district they visit.

The Lake Laboratory of the Ohio State University, located on Cedar Point, near Sandusky, will open June 20, and close July 29. The laboratory is close to the waters of Lake Erie and Sandusky Bay. There will be a course on entomology. Any information may be obtained from Prof. F. L. Landacre, Ohio State University, Columbus, Ohio.

Notes on Oncideres texana Horn in Georgia: Oviposition.

By A. A. GIRAULT.

The following notes may be useful:

On October 14, 1906, at Myrtle, Georgia, on a large plantation, a row of three-year-old pecan trees, in a small grove, was noticed to have occasional branches neatly cut off, resembling the work of a beaver in miniature. A single specimen of the forementioned Cerambycid was found at work, already having partially girdled a branch. These branches already cut off were found under the trees, on the ground. They measured in diameter 11 and 12 mm. (14 branches). Each branch, and also the one in process of being cut off, contained a number of isolated, small, roundish cavities, leading to the egg and which opened into longitudinal, flat grooves just beneath the bark, measuring on the average 4.20 mm. in length, not very much longer than the egg itself. These egg cavities were generally placed at the nodes, to one side of the leaf insertion and the last one was at the top end of the severed branch, or near it. There was but a single egg cavity at each node and under each cavity, generally, there were many, short, transverse cuts in the bark resembling transverse striae. These branches found on the ground, all recently severed, contained from 10 to 18 eggs, according to their length; usually there were no egg cavities at those nodes which were near to the basal or severed end of the branches. The cavities were closed with some mucilaginous substance, which may have been exuded sap. A few other girdled branches, containing eggs, as with those found on the ground, were still hanging to the trees, but were completely girdled and dead or dying. In many cases (one direct observation), a noticeable denuded area was found at the upper end of the girdled twig, *eaten* by the female beetle during resting periods. This area sometimes extended out onto the petioles of the terminal leaves.

In regard to the eggs themselves. Eleven (11) eggs deposited on October 13 and 14, contained perfect embryos and were hatching on November 24 and 25, making a period of embry-

onic development of about one and one-third months. After hatching had occurred, borings are usually to be noticed at the mouth of the egg cavity.

The eggs are deposited into the branch and the latter, then girdled, not the other way round as has been stated in the literature; at least this was true in the cases of two direct observations, one of which has already been stated. This, a female, was found feeding at the apical or top end of a branch, and crawling slowly back and forth between the top and bottom ends of it, on October 15 in the afternoon. Egg cavities containing eggs were then present. She continued these indolent movements through the morning of the 16th, but at 1 P. M. that day, she began to girdle the branch, working continuously throughout the afternoon and evening until at least up to 11 P. M., when the observation was discontinued; the day had been windy and cloudy. By the following morning (17th), a half of the circuit had been completed; from 6 A. M. to 1 P. M. of the 17th, the female was either at rest, motionless or else feeding at the apex of the branch, eating the bark; it began again on the girdle at nearly the same hour as on the previous day (1 P. M.), working continuously nearly up to midnight, by which time the girdle was almost completed; the day had been cloudy with a drizzling rain. At 7 A. M., October 18th, she was found resting at the upper end of the branch; the girdle was nearly complete. At 12.30 P. M. that day, she renewed her operations, working to windward, head downward, clutching the branch which was then leaning somewhat from the action of the wind. At 1 P. M., she was working in a driving rain; about an hour afterwards the branch fell over, blown by the wind, and the female abandoned it. Plainly, in this case, girdling followed oviposition. During the time of observation, the female worked during definite periods, the last half of the day and the first half of the night.

The two beetles observed were very slow and deliberate in their actions. They would spend hours alternately feeding, resting or crawling slowly up and down the length of the branch upon which they were at work. Their locomotion, dur-

ing the wandering periods, was slow, like an automaton, and the long antennae were nearly always held then so as to embrace, more or less, the branch. They were not curled around the branch but while in their natural positions held down against it, so that the proximal half of each antennae touched the branch on each side at some point along its length.

Questions and Answers from a Final Examination in Entomology—I.

(Sent to the NEWS by the Professor of Entomology in a university in one of the Western States.)

1. What special senses do insects possess?

"Insects can measure electrical currents with their feet, and can either see or have some method of communication through walls. The sense of direction is well shown as when it has gathered enough honey it will go straight to the hive."

2. Define parasitic, predaceous, secondary and tertiary parasitism.

"Parasitic means the form of a disease which almost all of the insects are infested."

"Parasitic means insects that are dependent upon other insects and plants for their food. The insects and plants they live on are called the host."

"Predaceous means that the insects must live on vegetation."

"An insect is predaceous if it takes the food away from another insect."

"Predaceous, regards food habit, it means very vicious food habit, being always hungry."

"Secondary parasitism is feeding on one host and partly on others."

"Secondary and tertiary parasitism mean the different forms of parasitic disease."

3. Why do insects moult?

"Insects moult in order to become more perfect. Every time an insect moults it is further developed."

4. Name the typical stages in complete metamorphosis.

"The typical stages in complete metamorphosis are egg; larva, pulpa and adult. When hatched from the egg it enters the larva state where it crawls around for awhile like a worm. It finally enters the pulpa stage where legs are formed and wings and as soon as these are formed it becomes an adult."

5. Define elytron, cercus and tegmina.

"Elytron is the hard, black portion on the back of the beetle."

"Cercus—sort of a spike-like projection at tip of abdomen in female."

"Cercus is an appendage on the end of the abdomen of the grasshopper used in carrying things and for fighting."

"Tegmina, the opaque cell on the front edge of the wing near the outer end."

6. Give four types of Hymenoptera.

"Hymenoptera—Squash bug, assassin bug, potato bug, Giant water bug."

7. Discuss methods of insect dispersal. (100-200 words).

"There are different methods of insect dispersal. One way is by wind, being carried a great distance by a hard windstorm. They are also carried by water the insect laying an egg and this being fastened to a piece of wood that is carried by the water to a great distance. Sometimes the insect is carried also in the same method as the egg is carried. Insects are carried from one place to another by birds and by this method they are scattered over different countries as birds are known to fly from one country to another. Animals also carry them about to different localities. The importation of grains and fruits and other products from the different countries have brought into the country to which the goods were shipped many insects that are not known to the country."

8. Discuss possible rapidity of reproduction in insects, and the natural checks which hold them within bounds.

"Insects are about the rapidest in reproduction of the different things known. To show how many insects could be formed in one year, take two flies and if the female fly laid 100 eggs during its life and half of those were female and each one of the female laid 100 eggs and so on at the end of the year there would be about eighty million bushel of flies. It is the same with nearly all insects that the reproduction is very rapid. The *tergites* are very fast reproducing insects, the female laying about 50 to 100 a second, and at that rate there would be a great many of these insects produced in a year. If it was not for the different natural methods of checking the increase the countries would be over-run by them."

"There is a fungi disease that affect different insects, and it is this fungi that kills the grasshopper and keeps it from increasing so rapidly."

"Insects are not comparable to man in their reproduction since there are scarcely any insect which produce only one other insect in a year. On the contrary, insects produce many eggs which hatch and produce several hundred insects which in turn produce several hundred more."

"The grasshopper can produce one species in the spring and in the fall that species will produce another species, and it runs on like that until several hundred species may be produced."

ENTOMOLOGICAL NEWS.

[The Conductors of ENTOMOLOGICAL NEWS solicit and will thankfully receive items of news likely to interest its readers from any source. The author's name will be given in each case, for the information of cataloguers and bibliographers.]

TO CONTRIBUTORS.—All contributions will be considered and passed upon at our earliest convenience, and, as far as may be, will be published according to date of reception. ENTOMOLOGICAL NEWS has reached a circulation, both in numbers and circumference, as to make it necessary to put "copy" into the hands of the printer, for each number, three weeks before date of issue. This should be remembered in sending special or important matter for a certain issue. Twenty-five "extras," without change in form, will be given free, when they are wanted; and this should be so stated on the MS., along with the number desired. The receipt of all papers will be acknowledged.—ED.

PHILADELPHIA, PA., MAY, 1910.

The NEWS is not always scientific. This statement has been made from time to time, and in the past we have several times referred to it. We suppose that some people think that anything that is not dryasdust reading, like the dictionary, is not scientific. Science, very broadly speaking, is knowledge. One of Webster's definitions of science is as follows: "Accumulated and established knowledge, which has been systematized and formulated with reference to the discovery of general truths or the operation of general laws; knowledge classified and made available in work, life, or the search for truth; comprehensive, profound, or philosophical knowledge." Some scientists are born such, and when they grow up they read the descriptions of new species and like matters with the avidity that the small boy shows for his dime novel. Next there is the scientist that is made. He has taken up scientific studies from a profound love of Nature, and is fond of the glorious sunshine, the shady woods, the wild-flowers, the multiplicity of life out of doors and the desire to investigate these wonders. He is here by a process of evolution. At one time he may have been a boy who collected insects and someone told him there was a journal devoted to the study of such creatures. If on procuring his journal he finds it entirely devoted to descriptions of new Bombycidae and Culicidae his heart would be chilled, as he was not born a great scientist, but is one by later

development. The NEWS, if supported only by the born scientists, and the professionals, would die like a gnat in the cyanide jar. The majority of our subscribers are collectors, amateurs and lovers of Nature, and we believe that they believe that science is knowledge, and that knowledge is not necessarily dry science. When all our subscribers, through time and reading the NEWS, have become sufficiently scientific to dote on descriptions of new species and lists of genera in the Coccidae and Culicidae, we will gladly supply such things alone. We believe that the great success of the NEWS could be materially increased by articles that present knowledge, scientific knowledge, but in a more attractive form. We would still cater to our born scientist, but we would not discourage everybody else, especially the embryo scientist who is now only a collector and a lover of Nature.

Notes and News.

ENTOMOLOGICAL GLEANINGS FROM ALL QUARTERS OF THE GLOBE.

MR. A. F. BURGESS, expert in charge of breeding experiments in regard to the prevention of spread of the Gypsy Moth, 6 Beacon street, Boston, Mass., would like data in regard to *Calosoma* and *Carabus*, and living specimens of these beetles will be much appreciated if sent to him.

THE EDITOR "News."

Dear Sir: Is anything being done by representative Entomologists in the East with regard to customs duty on insects? The trouble here is not so much the actual fact that I have to pay a few dollars to the United States Treasury (or wherever they go), as the fact that there is always great delay and difference of opinion in assessing the value of specimens.

A friend, say in South America, sends me as a present a number of pinned Hemiptera, who is to judge what their value is? How can the value be appraised?

It is such a petty matter, anyhow, that the total abolishment could not make any difference to the Treasury. As it is, it depends entirely where one is, how much one pays and how much trouble one has.

In several instances I have had to decline offers made by European museums and other extra-American people to examine material (which I much wanted to do), because of the expense and trouble involved.

G. W. KIRKALDY, Honolulu, T. H.

MR. ROBERT DICKSON, of Pittsburgh, Pennsylvania, is doing good work in blown larvæ of the Lepidoptera. The specimens of inflated caterpillars, mounted on their food plants, are admirable.

DR. WM. A. RILEY, of Cornell University, says, "In these days no one seems to have a good word for the house fly. But Moufet said that 'they show and set forth the omnipotency of God; and execute His justice; they improve the diligence and providential wisdom of man; all of which reminds one strongly of David Harum's defense of dog fleas."

AN INTERESTING report to Mr. Gershom Smith, Comptroller of the Pennsylvania Steel Company has been sent from The Spanish-American Iron Company at Daiquri, Cuba., which shows the value of economic entomology. The report of the work is by Mr. Bruno Fox, Sanitary Inspector in charge.

In 1902 there were 1,362 cases of malaria and since that time there has been a gradual reduction. In 1909 the cases numbered only 234. During the year there were 1,391 men on the pay-roll and the average number of patients in the hospital daily was fourteen, in other words there was only one per cent. of the force on the sick list.

The work of the Sanitary Squad consists of the daily collection and burning of all household rubbish, the care and cleaning of the barracks, a house to house inspection of sanitary conditions, care of water tanks and water barrels in the mine cuts, petrolization of standing water, general cleaning of the villages and camps and, fist, last, and all the time war on the mosquito. The men themselves, who looked on the whole matter of mosquito fighting as a joke and were thoroughly indifferent, are now beginning to appreciate the results, and are quick to call attention when the wire-gauze covers to the water barrels in the mine cuts are worn out or broken.

The cost of the work for the year was approximately one thousand dollars a month. The value of this work is difficult to estimate in figures. The greatest value is contingent and appears in general cleanliness, health, cheerfulness and efficiency. But there is one point where its value in dollars and cents can be figured. With our present force, it means at least ten men less in the hospital each day. Instead of being a charge on the work, these ten men produce during the year 8,000 to 9,000 tons of ore, which far more than repay the expenditure for sanitation. From the low motive of selfishness, therefore, it pays and from every higher point of view the result would warrant the expenditure, if there were no financial return." The above is a brief extract from this interesting report.

Entomological Literature.

COMPILED BY E. T. CRESSON, JR., AND J. A. G. REHN.

Under the above head it is intended to note papers received at the Academy of Natural Sciences, of Philadelphia, pertaining to the Entomology of the Americas (North and South), excluding Arachnida and Myriapoda. Articles irrelevant to American entomology, unless treating of new genera, will not be noted; but contributions to anatomy, physiology and embryology of insects, however, whether relating to American or exotic species, will be recorded. The numbers in **Heavy-Faced Type** refer to the journals, as numbered in the following list, in which the papers are published, and are all dated the current year unless otherwise noted. This (°) following a record, denotes that the paper in question contains description of a new genus; while this (*), that of a new North American form.

For complete record of Economic Literature, see the Experiment Station Record, Office of Experiment Stations, Washington.

1—Proceedings, Academy of Natural Sciences of Philadelphia. **5**—Psyche, Cambridge, Mass. **7**—U. S. Department of Agriculture, Bureau of Entomology. **8**—The Entomologist's Monthly Magazine, London. **9**—The Entomologist, London. **10**—Nature, London. **11**—Annals and Magazine of Natural History, London. **16**—Bulletin, Societe Nationale d'Acclimation de France, Paris. **40**—Societas Entomologica Zurich. **45**—Deutsche Entomologische Zeitschrift. **51**—Novitates Zoologicae, Tring, England. **59**—Sitzungsberichte, Gesellschaft der naturforschenden Freunde, Berlin. **73**—Archives, Zoologie Experimentale et Generale serie 5, Paris. **83**—Notes from the Leyden Museum. **86**—Annales, Societe Entomologique de France, Paris. **89**—Zoologische Jahrbucher, Jena. **102**—Proceedings, Entomological Society of Washington. **108**—The Agricultural Journal, Department of Agriculture, Cape of Good Hope, Cape Town. **128**—Proceedings, Linnean Society of New South Wales, Sidney. **143**—Ohio Naturalist, Columbia, **153**—Bulletin, American Museum of Natural History, New York. **163**—American Journal of Science, New Haven, Connecticut. **166**—Internationale Entomologische Zeitschrift, Guben. **192**—The Cairo Scientific Journal, Alexandria. **216**—Entomologische Zeitschrift, Stuttgart. **221**—New Hampshire Agricultural Experiment Station, Durham, N. H. **222**—Purdue University Agricultural Experiment Station, Lafayette, Ind. **223**—Broteria, Revista de Sciencias Naturaes do Collegio de S. Fiel. (Ser. Zoologica). **224**—Bulletin, Buffalo Society of Natural Sciences. **225**—Bericht, Naturwissenschaftlich—Medizinischer Verein in Innsbruck. **226**—Transactions, Academy of Sciences of St. Louis. **227**—Memorias, Instituto Oswaldo Cruz, Rio de Janeiro. **228**—Georgia State Board of Entomology, Atlanta. **229**—Trabajos, Laboratorio de Investigaciones Biologicas de la Universidad de Madrid. **230**—Revista. Museo de la Plata, Buenos Aires. **231**—Annuaire, Musee Zoologique de l'Academie Imperiale des Sciences de St. Petersburg. **232**—Philippine Journal of Science, General Science, Manila. **233**—Iowa State College of

Agricultural and Mechanical Arts, Experiment Station, Ames.

GENERAL SUBJECT. American Economic Entomology, **10** lxxxiii, 47. **Cockerell, T. D. A.**—Some insects collected in northwestern Colorado in 1909, The University of Colorado Studies, vii, 126. **Cook, M. T.**—Cecidology in America, Botanical Gazette xlix, 219. **Iches, L.**—Les insectes ennemis des cotonniers dans l'Argentine et leurs parasites, **16,** lvii, 64. **Needham, J. G.**—General Biology: a book of outlines and practical studies for the general students (includes much on insects). Ithaca. The Comstock Publishing Co. 1910. **Thayer, G. H.**—Concealing-coloration in the animal Kingdom. (Insects page 183). New York. The Macmillan Co. 1909.

APTERA. Rothschild, N. C.—A new flea from California, **8** xxi, 88 (*). Chiastopsylla, a new genus of Siphonaptera, **9,** xliii, 105, (°).

NEUROPTERA. Bugnion, Ed.—Le Termite noir de Ceylan (Eutermes monoceros), **86,** lxxviii: 271 .**Martynou, A.**—Les Trichopteres due Tibet oriental et du T saidam d'apres les materiaux collectionnes par l'expedition de la Societe Imperiale Geographiques Russe. (New descriptions in English and Russian), **231,** xiv, 256, 1909, (°). **Navas, R. P. L.**—Crisopidos nuevos, **223,** ix, 38, (°). **Tillyard, R. J.**—Studies in the life-histories of Australian Odonata, **128,** xxxiv, 256, 370, 1909.

ORTHOPTERA. Allard, H. A.—Musical crickets and locusts in North Georgia. **102,** xii, 32 **Burr, M.**—The fauna of British India including Ceylon and Burma. Dermaptera. London, Taylor & Francis, 1910. **Morse, A. P.**—A hopperdozer for rough ground, **5,** xvii, 79. **Rehn, J. A. G.**—On some Orthoptera from Porto Rico, Culebra and Vieques Islands, **153,** xxviii, 73 (*). **Rehn & Hebard.**—An Orthopterological reconnoissance of the Southwestern U. S. Part III. California and Nevada, **1,** lxi, 409, 1909, (*). **Van Ryneveld, A.**—Locust destruction, 1909-1910. Invasion by brown locust (Pachylylus sulcicollis), **108,** xxxvi, 158.

HEMIPTERA. Banks, C. S.—Rhynchota Palawanica, Part I Heteroptera, **232,** iv, 553, 1909 (°). **Breddin, G.**—Beitrage zur Systematik der Pentatomiden Sudamerikas. Viertes Stuck, **59,** 1909, 615. **Cockerell, T. D. A.**—A new mealy-bug (Coccidae) from S. America, **9,** xliii, 113. **Oshanin, B.**—Verzeichnis der palaearktischen Hemipteren. Heteroptera, 1. Band, lll, Lieferung, 1909. **Van Duzee, E. P.**—Monograph of genus Crophius, **224,** ix, 389, 1909 (*). **Webster, R. L.**—The apple-leaf hopper (Empoasca mali), **233,** Bull. No. 111. **Wilson, H. F.**—Notes on the two papers on Aphididae by Rafinesque, **102,** xii, 27. **Woodbury, C. G.**—The San Jose scale. Some sprays for its control, **222,** Bull, No. 138. **Worsham & Chase.**—The San Jose Scale and some experiments for its control, **228,** Bulletin, No. 31.

LEPIDOPTERA. Busk, A.—Two new American species of the genus Ethmia, **102,** xii, 53 (*). A correction. (Socorypha should be Isocorypha), **102,** xii, 26. **Dyar, H. G.**—The larva and food-

plant of Glyptocera consobrinella, **102,** xii, 52. A new Euclea (E. trichathdota), **102,** xii, 26, (*). Two new species of Laetilia, **102,** xii, 54 (*). **Haensch, R.**—Die Grossschmetterlinge der Erde, II., Hauptteil. Exotica, 1, Abteil. Fauna Americana, 20 Lief. **Hoffmann, F.**—Wie soll man sich die theoretischen Kenntnisse der einzelnen Schmetterlingsgruppen aneigen? **216,** xxiii, 225, 230. **Rau, P.**—Observations on the duration of life, on copulation, and on oviposition in Samia cecropia, **226,** xix, 21. **Reiff, W.**—On the resistance of gypsy-moth eggs (Liparis dispar) to cold and other conditions, **5,** xvii, 69. Einige Flacheri-Experimente mit der "Gypsy moth" (Liparis dispar), **40,** xxiv, 178. Die lebenweise der raupe von catocala pacta im freien, **166,** iii, 379, 1909. **Rothschild, W.**—Catalogue of the Arctianae in the Tring museum, with notes and descriptions of new species, **51,** xvii, 1. **Sanderson, E. D.**—The codling moth and how to control it by spraying. **221,** Bulletin, No. 143. **Strand, E.**—Zwei neue afrikanische Hesperiiden, **166,** iii, 402, 1909, (°). **Turner, A. J.**—New Australian Lepidoptera belonging to the family Noctuidae, **128,** xxxiv, 341, 1909, (°). **Walsingham, Lord**—Biologia Centrali-Americana. Lepidoptera Heterocera. Vol. IV. pp. 1-24, (*).

DIPTERA. Becker, R.—Zur kenntmis der mundteile und des kopfes der Dipteren-larven, **89,** xxix, 281. **Boyce, R. W.**—Mosquito or man? The conquest of the tropical world. New York. E. P. Dutton & Co., 1909. **Cajal, S. R.**— Nota sobre la estructura de la retina de la mosca (M. vomitoria), **229,** vii, 217, 1909. **Dickinson, H. E.**—Mosquitos and fish, **192,** iv 19. **Hine, J. S.**—A comparative study of four genera of horseflies, **143,** x, 149. **Johnson, C. W.**—A note on the species of Fucellia of eastern No. America, **5,** xvii, 76. **Lutz, A.**—Contributcao para o conhecimento das especies brazileiras do genero "Simulium. Beitrag zur kenntniss der brasilianischen Simuliumarten, **227,** 1, 124, 1909. **Melander, A. L.**—The genus Tachydromia, **5,** xvii, 41, (*). **Perez, C.**—Recherches histologiques sur la metamorphose des muscides (Calliphora erythrocephala), **73,** iv, 1. **Thibault, J. K.**—Notes on the mosquitoes of Arkansas, **102,** xii, 13.

COLEOPTERA. Bourgeois, J.—Malacodermes et Lymexylonides de Ceylan, **86,** lxxviii, 422, (°). **Bruch, C.**—Nuevas especies de los generos Philochloenia y Demodema (Coleopteros Lamelicornios), **230,** xvi, 340, 1909. **Bugnion, Ed.**—Les metamorphoses de l'Eumorphus pulchripes de Ceylan, **86,** lxxviii, 283. **Champion, G. C.**—Biologia Centrali-Americana, Coleoptera. Vol. IV. part 7, pp. 49-78, pl. iii, (*). **Chapman, J. W.**—The introduction of a European Scolytid (the smaller elm barkbeetle, Scolytus multistriatus) into Massachusetts, **5,** xvii, 63. **Chase, W. W.**—The plum circulio and methods for its control, **228,** Bulletin, No. 31, Part 1. **Gillet, J. J. E.**—Especes nouvelles du genre Copris releve synonymique des especes decrites a ce jour, **83,** xxxii, 1. **Hofender,**

K.—Mengenilla n. g. Chobautii n. sp. Eine neue Strepsiptere aus Nordafrika, **225,** xxxii, 33, (°). **Horn, W.**—Megacephala (Phaeoxantha) tremolerasi, n. sp., **230,** xvi, 32, 1909. **Leveille, A.**—Coleopterorum catalogus. Pars 11. Temnochilidae. **Ohaus, F.**—Neue Coleoptera lamellicornia aus Argentinien, **45,** 1910, 173, (°). **Olivier, E.**—Description d'un Lampyride nouveau de la Republique Argentine, **230,** xvi, 50, 1909. **Pic, M.**—Description de deux Coleopteres de l'Amerique meridionale, **230,** xvi, 37, 1909. **Ross, E.**—Deliathis incana, eine Lamiini de aus Yucatan im hafen von Neufahrwasser bei Danzig, **166,** iii, 446, 1909. **Webster, F. M.**—The clover root-borer (Hylastinus obscurus), **7,** circular No. 119. **Wickham, H. F.**—New fossil Coleoptera from Florissant with notes on some already described, **163,** xxix, 47. A list of the Van Duzee collection of Florida beetles, **224,** ix, 399, 1909.

HYMENOPTERA. Cockerell, T. D. A.—Descriptions and records of bees, **11,** v., 256, (*). **Ferton, C.**—Notes detachees sur l'instinct des Hymenopteres melliferes et ravisseurs. (5th Serie), **86,** lxxviii, 401. **Friese and Wagner.**—Zooligische studien an Hummeln. 1. Die Hummeln der deutschen Fauna, **89** xxix, 1. **Kieffer, J. J.**—Description de nouveaux micro-hymenopteres du Bresil, **86,** lxxviii, 287, (°). **Morley, C.**—On the Hymenopterous parasites of Coccidae, (continued) **9,** xliii, 110. **Rohrwer, S. A.**—A new genus of sawflies from Chile, **102,** xii, 30 (°). Some new wasps from New Jersey, **102,** xii, 49, (*). **Schrottky, C.**—Beitrag zur kenntnis der Scoliidae and Eliddae aus Argentinien und Paraguay, **45,** 1910, 195. Nuevos Himenopteros Sudamericanos, **230,** xvi, 137, 1909, (°). **Schulthefs Rechberg, A.**—Ueber einige neue und weiniger bekannte Eumeniden, **45,** 1910, 187 (°). **Wheeler, W. M.**—Small artificial ant-nests of novel patterns, **5,** xvii, 73. Ants; their structure, development and behavior. New York. The Columbia University Press., 1910.

REVIEWS.

General Biology. * * * A Book of Outlines and Practical Studies for the General Student, by James G. Needham, Ph.D., Assistant Professor of Limnology and General Biology in Cornell University, with 64 Practical Studies, 287 Text Figures, and 9 portraits, Ithaca, N. Y. The Comstock Publishing Co. Price, $2.00.

This work contains a considerable amount of entomology. The following illustrate the character of some of the studies: "Flowers adapted to insect visitation; insects adapted to visiting flowers; the relative fitness of different visitors to one kind of flower; an examination of all the flowers visited by some common insect; a case of precise adaptation; a study of common galls; observations on ants and

aphids." There is a chapter on the veins in the wings of insects and considerable space is devoted to the life cycle and transformations of insects. Under adjustment of organisms to environment, insects are also treated. This work will appeal to the student of entomology, who also wishes to have a general review of the lives and activities of animals other than insects, and plants. Prof. Needham being an entomologist as well as a general biologist has introduced more on insects than is usually found in such works.

ANTS, THEIR STRUCTURE, DEVELOPMENT AND BEHAVIOR, by William Morton Wheeler, Ph. D., Professor of Economic Entomology, Harvard University; Honorary Curator Social Insects, American Museum of Natural History. New York, Columbia University Press, 1910. Price, $5.00. The author of the work says:

"If an excuse was required for its publication, one might be found in the fact that for many years no comprehensive treatise on the ants has appeared in the English language." The extent of the literature of Entomology, possibly nearly fifty per cent. of Zoological literature, and its scattered and often fragmentary character militate against the study of the subject. When a master gives us not only a digest of this but also the benefit of his own studies and original observations we should indeed be grateful.

The subject is covered in the most thorough manner and could probably not be more complete without going into detail beyond the limits of the work. There are thirty chapters and valuable appendices. The chapters are divided into a number of parts, each taking up some special subject. Some idea of the contents may be obtained from the chapter headings as follows. As dominant insects; the external structure; the internal structure; the development; polymorphism; the history of myrmecology and the classification; the distribution; fossil ants; general habits; nests; ponerine ants; driver and legionary ants; harvesting ants; the relations of ants to vascular plants; fungus growing ants; the relations to plant-lice, scale-insects tree-hoppers and caterpillars; honey ants; persecuted and tolerated guests; true guests, ecto, and entoparasites; compound nests; temporary social parasites; sanguinary ants, or faculative slave-makers; amazons, or obligatory slave-makers; the degenerative slave-makers; the degenerative slave-makers and permanent social parasites; the sensations of ants; the instinctive behavior of ants; the plastic behavior. The appendices take up the following subjects: Methods of collecting, mounting and studying ants; key to the subfamilies, genera and subgenera of the North Ameri-

can Formicidae, for the identification of the workers; a list of described North American ants; methods of exterminating noxious ants; literature. There are 286 excellent figures and photographs, most of which are original. The typography of the work is all that can be desired and the arrangement of the matter very good.

It will be many years before this work outgrows its usefulness and at the present time it is badly needed. These insects, on account of their many interesting habits make them fascinating objects of study and a book like this will undoubtedly lead many to take a new interest in the subject and may be the means of inducing others to investigate the Formicidae for themselves. Dr. Wheeler has given us a work of unusual value and one of which he may well be proud, and the entomologists of America may congratulate themselves on having among their number one who is such a painstaking, earnest and able student. No entomological library can be complete without this book and as already mentioned it will long be authoritative. The keys, list of described species and the bibliography are especially useful and will appeal to a number of students who are not specialists.

Doings of Societies.

The twenty-second annual meeting of the Feldman Collecting Social was held January 19, 1910, at 1523 S. Thirteenth Street, Philadelphia, and ten members were present, President Harbeck in the chair. He read his annual adddress, which was ordered to be incorporated in the minutes.

The officers of the previous year were nominated and elected to serve during the present year as follows: H. S. Harbeck, President; F. Haimbach, Vice-President; H. W. Wenzel, Treasurer; Geo. M. Greene, Secretary, and C. T. Greene, Assistant Secretary.

Prof. Smith spoke of the fauna of Mexico.

Mr. Wenzel spoke of the fine opportunity for breeding small insects from the many twigs which were broken off during the recent heavy snow storm.

Mr. Daecke exhibited two specimens of *Dicymolomia julianalis* Wlk. and stated that on September 14, 1909, Mr. A. F. Satterthwait collected near Middleton, Pa., a number of cattails from the cat-tail rush. Examining these, Mr. S. noticed

infestation and soon after specimens of *D. julianalis* began to appear and are still emerging at this date, January 19, 1910. A number of Ichneumon flies were also bred from this cage.

Prof. Smith spoke of the "wood leopard moth" around Harvard University and said it seems as though there is nothing done to stop the ravages of this insect in that locality. (Life of larva is about two years.) He said the English sparrow is the only bird that keeps down the moth here and on account of the numerous gray squirrels on the campus the sparrows are absent and consequently the moth breeds there.

Adjourned to the annex.

CHAS. T. GREENE, *Assistant Secretary.*

At a regular meeting of the Feldman Collecting Social, held February 16, 1910, at 1523 S. Thirteenth Street, Philadelphia, eleven members were present, President Harbeck in the chair.

After reading an extract from a letter sent by Mr. Manee at Southern Pines, N. C., saying that on October 27 and November 22, 1909, he had split from pitch pine cord wood fresh imagoes of *Buprestis striata* Fabr., a species which is in the open in April and May, proving thereby that it must remain in the adult for several months, Mr. Wenzel made many interesting remarks on this genus.

Mr. Daecke exhibited three species of Scenopinidae and stated that the window fly, common in Philadelphia, is *S. glabrifrons* and not *fenestralis* as is usually supposed. *S. fenestralis* seems to be more common in Harrisburg. A pair of *Metatrichia bulbosa* O. S. which he collected on top of the Blue Mountains near Harrisburg, August 8, 1909, adds a new species and a new genus to the State. It was previously recorded from Missouri. He exhibited also specimens of *Traginops irrorata* Coq., a rather rare Agromyzid, and stated that a great many were found on running sap of an oak tree on top of the Blue Mountains near Harrisburg, August 8, 1909. He also exhibited a fly, *Pterodontia flavipes* Gray, collected by H. A. Wenzel in beating pine at Calandar, Ontario, July 19,

1909. There is one specimen in the Amer. Ent. Soc. collection from Georgia.

Dr. Skinner mentioned a moth, *Gastropacha americana* Harr., bred inside and brought to the Academy alive, which had laid eggs. He said if they should prove to be fertile the male moth must have emerged at this time of year too. He described the larva and told how hard it was to see, as its markings are ranged in exact duplicate of those on the bark where it rests. This led to a discussion on protective mimicry.

Mr. Haimbach said he had collected a small moth in pot of lamp-black where he found larvae feeding.

Adjourned to the annex.

GEO. M. GREENE, *Secretary.*

OBITUARY.

GEORGE WILLIS KIRKALDY.

1873-1910.

The fulfillment of sad duties is the lot of man. To me has come that of making known the death in the flower of his manhood, of George Willis Kirkaldy, my good friend.

After a separation of some months from his wife and little one, whom he worshipped, he went to San Francisco, where they were, to spend the Christmas holidays with him. While there, he was induced to submit to a fifth operation on an old fracture of the leg and although it was successful he grew gradually weaker and weaker, and less than a week later, on the 2d of February, he breathed his last. That acute intellect, that ceaseless, untiring worker was at rest! His course was run, and he fell ere he grasped the bays that were to crown his achievement.

George Willis Kirkaldy was born at Clapham, in 1873, and was therefore in his 37th year. From his youth he evinced a great love for natural history, but after finishing his studies in the City of London School, he went into the city, where he remained until 1903, when he accepted a position in Honolulu, with the Hawaiian Department of Forestry and Agriculture.

Then began the happiest and most productive period of his life, and there also he met with the accident that eventually was to deprive the world of the most promising of the younger generation of scientific hemipterologists. Shortly after his arrival in Honolulu, while out riding, he forgot the American rule of the road, and turned his horse, after the English fashion, to the left as he came to a turn in the road, and crashed into a carriage coming in the opposite direction. His horse fell on him and crushed his leg. This was badly set, and after the bones had knit, it had to be broken again and reset. This operation was repeated at intervals no less than four times, the last with fatal results. There, too, he met the lady who became his wife; there his little ones were born, and his little son, George, the first and best beloved, died in infancy.

Freed from the sordid details of clerical work, in his new position, he was in his element. He did not, indeed, care greatly to work on other groups of insects, and at times the daily routine of the economic entomologist was irksome, but nevertheless, whatever he did was done well, and he found time to dedicate to his researches in the Hemiptera, although nearly all the work he did was done at home in the evenings, after the day's task was done. Yet, in spite of the limited time at his command, he was able to produce enormous quantities of work of the highest character. At some time in the near future, I hope to be able to give at greater length an account of his work. For the present, I shall merely mention his great work on the Jassidae in connection with the Sugar Planters' Association work on the parasites of the sugar cane, and the general Catalogue of the Hemiptera, now in course of publication, both of which mark epochs in Hemipterology. Like every earnest worker in the Hemiptera, the nomenclatorial chaos into which the order had fallen soon forced itself upon his notice, and much as he disliked to neglect the biological phases of the group, he was impelled to endeavor to place this important branch of the subject on a stable basis. In the pursuit of this laudable object, he was compelled by the sheer logic of the circumstances, to take radical and iconoclastic measures, but

he regretted just as keenly as any of his opponents and critics the necessity of doing away with many a name hallowed, as it were, by long usage.

Kirkaldy had all the vivacity and ardor of the Celt, which may at times have led him to accept perhaps too quickly and maintain too enthusiastically views which a more mature judgment showed to be untenable. Joined to this was a relentless Scotch logical temperament, which drove him inexorably and unswervingly to conclusions which at times were opposed to his natural inclination, yet which his passion for truth compelled him to accept and battle for. Above all things he hated sham; he loathed that spirit of pompous and self-sufficient importance which curses some small men. A constant and tireless worker, a minute, patient, resourceful student, he ever looked singly to the advancement of the knowledge of the Heteroptera, that group so sadly and shamefully neglected in comparison with other orders. In that bright galaxy where shine the illustrious names of Fabricius, Burmeister, Dufour, Amyot, Fieber, Stål, and in our days, most happily still with us, of Reuter, Horváth, Montadon, Bergroth, his is not the dimmest, and had Azrael held his hand, he had shone among the most brilliant.

As for me, I have lost a dear friend, an inspiration and a lode star; one who encouraged me when I was faint; who helped me when I fell; to whose constant words of cheer I owe what little success I may have achieved. Our minds moved in harmonious accord; our gifts were complementary to each other, and in so far as one so insignificant might, I helped my friend in my small way, a feeble return for his many kindnesses.

Better than any, perhaps, I can gauge the loss to science by his untimely death. His worked planned, outlined in many a letter, carried out with his enthusiasm, his thoroughness, his energy, was destined to place him on the same lofty, still eminence where sits Stål alone, beyond the reach of the petty bickerings and disputes of the pseudo-great.

"And so the grim reaper reapeth among the flowers."

J. R. Torre de la Bueno.

EXCHANGES.

Not Exceeding Three Lines Free to Subscribers.

☞ These notices are continued as long as our limited space will allow; the new ones are added at the end of the column, and only when necessary those at the top (being longest in) are discontinued.

Dytiscidae wanted by exchange or purchase Henshaw's numbers 1236, 1239, 1241, 1260, 1271, 1272, 1307, 1311, 1336, 1337, 1341, 1351, 1363, 1373, 1376, 1398, 1407, 1416, 1429, 1450, 1453, 1456, 1070, 1471, 1500, 1503, 1504.—John D. Sherman, Jr., 335A, Decatur St., Brooklyn, N. Y.

Offered—Fine *Parn. apollo, delius, mnemosyne, Arg. paphia, A. aglaia, lathonia, Lyc. coridon, semiargus* and other butterflies. Wanted pupae of Papilios *S. geminatus, asiylus, excaecatus, cerisyi, myops*, cocoons of *gloveri*, etc.—J. W. H. Harrison, 181 Abingdon Road, Middlesbro, England.

Coleoptera—Many rare species from the Arkansas Valley, Kansas.—J. C. Warren, Mt. Hope, Kansas.

Coleoptera exchanged for species not represented in my collection. Endomychidae and Erotylidae especially desired.—R. J. Crew, 561 Carlan Ave., Toronto, Canada.

Exchange—Living pupae of *M. modesta, Sph. chersis, A. bicolor, Pap. cresphontes, Pap. asterias* for native or exotic Lepidoptera.—A. Mares, 2517 Homan Ave., Chicago, Ill.

Wanted in exchange, perfect specimens of the genus *Parasemia, Apantesis* and allied groups, also Pieridae and *Catocala*. List of duplicates will be sent on application; also want eggs of *Catocala* for cash or exchange.—M. Rothke, 835 Mathew Ave., Scranton, Pa.

Lepidoptera—Pupae of *cresphontes* and *troilus* to exchange.—F. Malkmus, 3735 Cottage Ave., St. Louis, Mo.

Lepidoptera—I have for exchange first-class *Catocala epione, lacrymosa, paulina, evelina, retecta, luctuosa, flebilis, robinsonii, curvata, obscura, residua, insolabilis, angusi, lucetta, ultronia, innubens, hinda, scintillans, nebulosa, palaeogama, anida, phalanga, habilis, basilis, cerogama, parta* ahd others. Wish *agrippina, subviridis, californica, frenchii, portia, aspasia, rosalinda, mariana, faustina* and *aholibah*.—Ernst Schwarz, 6310 Newstead Ave., St. Louis, Missouri.

I collect for cash. Locals only. Unique field. Price lists 2 cts. *Buprestis apricans*, 25; *Bradycinetus ferrugineus*, 35; *Dynastis tityrus*, 35; *Sandalus niger* ♀, 15. Red ♂, 25; black ♂, 20, etc.—A. H. MANEE, Southern Pines, N. C.

Papilioj kokonoj, interŝanĝe. Mi deziras ricevi interŝanĝe, du specimenojn de la skarabo (*Prionus giganteus*) por kvina specoj de la pli grandaj papilioj kokonoj de Norda Ameriko.—Howard Austin Snyder, Hermit Lane, Roxborough, Philadelphia.

Catocalae—Wanted for exchange or, preferably, cash, *sappho, marmorata* and southern and western species. Must be in fine condition.—Dr. Hermann Bosch, 25 East 65th St., New York.

Lepidoptera—I have for sale or exchange living pupae of *Papilio turnus, triolus, cresphontes; S. chersis, luscitiosa, modesta, quinquemaculata, achemon, undulosa, cecropia, polyphemus, promethia*, and many others as well as imagos. Want pupae of others not in my collection.—John Kythica, 1347 S. Scoville Ave., Oak Park, Ill., U. S. A.

Lepidoptera—Catocala wanted, particularly *sappho* and *marmorata*.—Dr. Hermann Bosch, 25 East 65 St., New York.

Wanted—For cash or exchange, pupae of all Sphingidae and Saturnians, also ova of Catocalae. Offer many rare North American and European Lepidoptera.—J. McDunnough, Decatur, Ill.

If you desire exchanges in North American and Exotic Lepidoptera, to our mutual advantage, please send me your address.—Paul A. Schroers, 3807 Folsom Ave., St. Louis, Mo.

Catocalae—Shall have larvae of *illecta* in April and chrysalids later, also larvae and pupae of other species for exchange. Wish species from Texas and the West, *marmorata*, *briseis*, *rosalinda*, *verrilliana* and *amasia*.—R. R. Rowley, Louisiana, Mo.

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